PUBLIC SCHOOL ARITHMETIC

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THE

PUBLIC SCHOOL ARITHMETIC

AND

MENSURATION.

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the Public Schools of Ontario by the
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THE

PUBLIC SCHOOL ARITHMETIC

AND

MENSURATION.

Authorized for use in the Public Schools of Ontario by the Minister of Education.

NEW EDITION.

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PREFACE.

The main purposes which have been kept in view by the authors of this Arithmetic are—(1) to aid a pupil in becoming accurate and rapid in calculation; (2) to train him in independent thinking and in applying his knowledge of number to the actual business transactions of life; (3) to aid the teacher in assigning applications of the various principles which have been explained. The classification of the problems has been given with this last aim mainly in view.

Explanations of theory and all formal rules have been omitted, the authors believing that teachers can best supply what is necessary in these respects, as the pupils are led to a clear comprehension of the principles which should be explained by the teacher before the pupils are required to examine the problems. It may be here stated that the exercises and problems are mainly intended to be used as applications of the theory taught. While no direct explanation of theory has been given, much has been suggested by the character of the problems and by their arrangement.

The definitions have been carefully prepared and stated in such a way that it is believed the pupil will find little difficulty in understanding them.

Numerous mechanical and practical exercises on the fundamental rules for seat work form an important feature of the book. In many cases the answers to the mechanical tests have been omitted to enable the teacher to judge of the progress of his pupils in accuracy and rapidity.

The exercises are a well-graded and progressive series, carefully arranged to develop the reasoning powers of the pupil, and at the same time to familiarize him with the important practical applications of the science of number.

The Metric System has been introduced to meet the growing demands of the time.

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CONTENTS.

PAGE

I.—DEFINITIONS, NOTATION, NUMERATION 7

II.—THE SIMPLE RULES—

I. Addition 11
II. Subtraction 22
III. Multiplication 30
IV. Division 37
V. Miscellaneous Exercises 43

III.—COMPOUND NUMBERS—

Tables, Definitions, Etc. 50

IV.—SIMPLE APPLICATIONS OF THE PREVIOUS RULES—

I. Bills and Accounts 60
II. Simple Measurements 63
  Carpeting 64
  Plastering 66
  Wall Paper 67
  Board Measure 68
  Rectangular Solids 69
III. Sharing 72
IV. Averages 75

V.—FACTORS, CANCELLATION, MEASURES, AND MULTIPLES—

I. Factors 78
II. Cancellation 79
III. Measures 80
IV. Multiples 82

VI.—FRACTIONS—

I. Definitions, Notation and Numeration 84
II. Reduction of Fractions 85
III. Addition of Fractions 90
IV. Subtraction of Fractions 92
V. Multiplication and Division of Fractions 95
VI. Complex Fractions 101
VII. G.C.M. and L.C.M. of Fractions 102
VIII. Denominate Fractions 103
IX. Applications of the Previous Rules 105

VII.—DECIMALS—
- I. Definitions, Notation and Numeration 115
- II. Addition of Decimals 117
- III. Subtraction of Decimals 118
- IV. Multiplication of Decimals 121
- V. Division of Decimals 122
- VI. Reduction of Decimals 124
- VII. Applications of the Previous Rules 125

VIII.—PERCENTAGE 129

IX.—APPLICATIONS OF PERCENTAGE—
- I. Trade Discount 134
- II. Profit and Loss 136
- III. Commission 138
- IV. Insurance 140
- V. Taxes 142
- VI. Simple Interest 144
- VII. Compound Interest 146
- VIII. Bank Discount 147
- IX. Stocks and Dividends 149
- X. Equation of Payments 152

X.—PARTNERSHIP 154

XI.—INVOLUTION AND EVOLUTION—
- I. Involution 156
- II. Square Root 158
- III. Cube Root 159

XII.—MENSURATION 161

XIII.—THE METRIC SYSTEM OF WEIGHTS AND MEASURES.... 172

XIV.—MISCELLANEOUS EXERCISES—
- I. Circulating Decimals 177
- II. Problems Relating to Work Done 180
- III. Clock Problems 181
- IV. Problems Involving Velocity 182
- V. Problems Involving the Sum and Difference of Two Numbers 183
- VI. Review Exercises for Third Class 185
- VII. Review Exercises for Fourth Class 187
- VIII. Review Exercises for Fifth Class 190

XV.—ANSWERS 198

ARITHMETIC.

CHAPTER I.

DEFINITIONS, NOTATION, NUMERATION.

A Unit is a single thing or a definite quantity; as 1 book, 1 foot, 1 score, 1 four-ounce weight, 1 half-ounce weight.

A Number is that which is applied to a unit or to a group of units for the purpose of answering the question "How many?" or "How much?"

Arithmetic is the science which treats of numbers and the art which uses them in computation.

Numbers are either **Concrete** or **Abstract.**

A Concrete Number is one which names the kind of unit used; as 4 tons, 6 horses, 3 dozen eggs, 5 half-ounce weights.

An Abstract Number is one in which the kind of unit is not named, as 4, 6, 9, 17.

Notation is the expression of numbers by means of symbols.

Arabic Notation is the expression of numbers by means of figures.

Roman Notation is the expression of numbers by means of certain letters called *Roman Numerals.*

Numeration is the reading or writing in words of a number expressed in symbols.

EXERCISE I.

Read and write in words the following:—

1.	6	5	9	7	8	4
2.	15	21	12	31	13	17
3.	16	61	71	81	18	92
4.	29	93	39	47	74	49
5.	94	86	68	76	67	32
6.	23	34	43	45	54	56
7.	65	78	87	91	19	24
8.	42	25	52	26	62	82
9.	28	95	59	69	96	97
10.	79	48	84	64	46	100

EXERCISE II.

Write in words the following:—

1.	500	700	800	200	600	400
2.	830	470	609	714	806	990
3.	607	706	670	760	901	109
4.	847	784	478	748	874	487
5.	205	406	507	705	570	750
6.	4705	5843	9168	2049	4905	4231
7.	8007	8070	8700	7080	7008	9045
8.	5068	9008	6202	1508	3746	5786
9.	2134	1234	1243	4321	4132	8009
10.	9001	1069	9601	9106	9610	9080

EXERCISE III.

Write in words the following:—

1.	40876	54089	30070	91111
2.	54089	40058	39007	40106
3.	81095	59100	95101	37698
4.	819075	891492	294716	410101
5.	210010	918005	231046	217006
6.	1476931	3796842	910010	2103001
7.	3091006	4007007	190100	3019047
8.	17091807	93704905	903705	21010101
9.	40097006	30910405	9317960	70000605
10.	2309400106	91491591691	1013210012	7060700001

EXERCISE IV.

Write in figures:—

1. Fifteen; twenty-one; thirty-four; seventy-eight; eighty-seven; nineteen; ninety-one.

2. One hundred; one hundred and seven; three hundred and sixteen; four hundred and forty; nine hundred and nine; nine hundred and nineteen; nine hundred and ninety-one.

3. One thousand; one thousand, four hundred and two; eight thousand and six; eight thousand and sixty; two thousand, four hundred and ninety-six.

4. One thousand and eleven; ten thousand, six hundred and four; twenty-nine thousand, four hundred and seventy; eighty thousand, nine hundred and ninety.

5. Eight hundred and four thousand and sixteen; two hundred and ninety-one thousand, seven hundred and four.

6. One million, one hundred and one thousand and one; five million, four thousand and thirty.

7. Nine hundred and fifty-four million, eight hundred and six.

8. Seven million, seven hundred and seven thousand, seven hundred and seven.

9. One hundred and forty-six million, one hundred and forty-seven thousand and forty-seven.

10. Five hundred and thirty-six million, three hundred and forty-seven thousand, nine hundred and seventy-two.

11. Six billion, ninety-five thousand, one hundred and forty-eight; seven hundred billion and one.

12. Ninety-nine billion, thirty-seven thousand and four.

13. Eight hundred and sixty-four billion, five hundred and thirty-eight million, two hundred and seventeen thousand, nine hundred and fifty-three.

14. Forty billion, four million, four hundred thousand, four hundred and fourteen.

15. Forty-nine trillion, fifty-eight thousand, seven hundred and ninety-eight.

EXERCISE V.

Write in Roman numerals:

1.	5	6	8	9	4
2.	15	16	18	19	14
3.	25	26	28	24	44
4.	49	45	94	98	99
5.	109	104	105	219	329
6.	240	249	394	388	356
7.	404	444	499	589	594
8.	796	789	777	766	699
9.	875	857	578	894	984
10.	973	965	999	987	944
11.	1900	1889	1899	1849	1904

EXERCISE VI.

Write in figures:—

1. XV, XC, XCIV, LXIX, XLIV, XCIX, LXXXIX, CX.
2. CXI, CIX, CXLIV, CCXXIX, DIV, CCXLIX, DCCIX.
3. CDIV, DCCXXX, DXL, CDXLIV, DXXIX, DCXXIV.
4. DCCCXXXIII, CDLXXXIV, CCCXXXIII, CDXXXIV.
5. DV, CDXXX, CCXCVII, CCXLIV, CCCXXIII, DLV.
6. MCXI, MD, MXIV, CMXC, CMXCIX, MCCCLIV.
7. MCCXC, MDLV, MCDXLIV, MIX, MCCXXII, MCDXC.
8. MMCCXXII, CMXLVII, MCMVI, MCD, MCMIX, MDLV.
9. MDCCXLIV, MCDXLIX, MDCLXVI, MMIX, MCXIX.
10. MDXCIX, MCM, MCMI, MDCCCXCIX.

EXERCISE VII.

1. Write in Arabic Numerals the smallest number that can be expressed by two figures; by three; by four.

2. Write in Roman Numerals the largest number that can be expressed by three figures.

3. What is the effect of writing a letter of less value before one of a larger value? Give four examples illustrating this.

4. To the left of only what letters can I be placed in Roman Notation?

5. To the left of only what letters can X be placed in Roman Notation?

6. Write the significant figures and express each in Roman Notation.

7. What letters in Roman Notation are never repeated?

8. Write in words the following sentences:—The earth is 92890000 miles distant from the sun. The length of the equator is 43827033 yards. The cheese factories of Ontario produced 137362916 pounds of cheese in 1897. The milk used in making this cheese was 1455937148 pounds. In 1898 the 98 creameries making returns to the Bureau of Industries produced 9008992 pounds of butter, valued at 1632234 dollars.

9. What numbers can be expressed by means of the letters V and X taken separately or in combination?

10. Express in Arabic Numerals all the numbers of three figures that can be expressed by means of the letters X and C taken together or separately.

CHAPTER II.

THE SIMPLE RULES.

I. ADDITION.

Addition is the process of finding a number equal to two or more numbers of the same kind.

The Addends are the numbers to be added together.

The Sum is the single number which results from the addition.

The sign of addition is +, called *plus*, and when placed between two numbers it shows that these are to be added.

EXERCISE VIII.

1.	22	14	41	52	42
	33	21	23	12	12
	21	32	13	25	15
2.	123	421	241	222	234
	321	110	345	333	311
	231	242	102	123	132
	313	123	410	321	321
3.	1345	2111	1012	1000	4443
	2231	4001	3421	1234	2224
	2423	2403	1323	2423	1201
	3000	3121	4231	5341	2100
4.	5123	4112	5231	7111	7231
	4132	5234	4211	5000	3412
	6210	7110	5341	3123	4123
	3111	4231	6204	4351	5201

5.	71112	52123	71241	71122	82013
	41231	41024	32026	20311	41012
	51640	62301	41010	42133	50601
	41013	70021	52401	54332	41203

6. 2031+1234+3122+1010+100.

7. 1207+3040+2430+112+2000.

8. 51+3027+2000+1500+1320.

9. 21021+12+32+2700+12000+102+21.

10. 12201+21+142+23000+2100+2012.

EXERCISE IX.

1. John has 10 cents; Bob has 25 cents; Harry has 14 cents. How many cents have they together?

2. A cow cost $21, a pig $14, and a sheep $12. How much did all cost?

3. A farmer drew five loads of wheat to market. He had 41 bushels in the 1st load, 42 in the 2nd, 40 in the 3rd, 42 in the 4th, and 44 in the 5th. How many bushels were in the five loads?

4. I walked 21 miles on Monday, 22 on Tuesday, 21 on Wednesday, and 23 on Thursday. How far did I walk in the 4 days?

5. A train goes 31 miles the 1st hour, 30 the 2nd, 32 the 3rd, and 31 the 4th. How far has it gone in the 4 hours?

6. The population of four cities is as follows: the first 111203, the second 212123, the third 11221, and the fourth 611222. What is the total population of these four cities?

7. A merchant bought four pieces of cloth. The first was 203 yards long, the second 321, the third 223, and the fourth 222. How many yards were in the four pieces?

8. An ocean steamship sailed 312 miles on Tuesday, 324 miles on Wednesday, 320 miles on Thursday, and 411 miles on Friday? How far did it sail on these 4 days?

9. A steamship leaving Montreal for Liverpool had on board 415 cattle, 240 sheep, and 131 horses. How many head of live stock were on board?

10. A history consists of 4 volumes. In the first there are 412 pages, in the second 410, in the third 415, and in the fourth 431. How many pages are there in the entire history?

EXERCISE X.

1.	323	233	123	312	311	2323
	232	222	132	123	233	3211
	333	333	213	323	322	2332
	233	310	231	333	113	3123
	312	232	321	223	333	2323
2.	3233	2133	2323	3213	23132	32133
	3233	3032	3223	2133	21332	32332
	2332	3321	3332	3321	33213	32223
	3123	3333	2332	2332	23323	23322
	3321	2332	3212	3323	32133	12233
3.	31333	21321	32212	23213	23213	32132
	23213	21332	31232	23223	32123	22321
	31220	32132	21332	32213	32233	31223
	33303	32013	21321	33223	32213	20301
	10332	32103	33233	13322	32132	21303
	12321	23321	13321	32332	21331	33233
4.	34124	41234	24134	41234	41341	21314
	31413	32134	24413	44341	24143	44143
	24130	24341	34123	24132	34124	21321
	24133	43214	41244	41421	34143	40143
	40241	43441	32412	34134	21414	21434
	30213	14234	22141	21414	34140	24143
5.	13412	41324	41321	51321	32132	51324
	46712	62132	35326	41324	46213	42676
	35273	41653	45624	41324	24132	25014
	24134	25625	52334	50604	36213	30629
	45652	32134	41302	60621	41621	46532
	35213	43253	10343	40132	41321	42624
6.	41324	41324	41321	32562	41324	41321
	34120	16213	62162	31416	30143	41032
	60462	40123	42342	20413	62143	40162
	30621	30623	62103	40162	40132	32162
	41032	43216	66552	41324	40110	41314
	41621	21432	45625	51602	62162	62132

7.	5232	41321	32134	413212	3121	37124
	4013	60213	22343	413216	4137	34135
	6217	41602	40262	413210	5702	25312
	3017	41321	32163	465271	3562	40352
	1472	42321	41323	617172	5213	70712
	1213	41621	41621	312711	4134	34372

8.	81876	41342	21341	41832	41372	41783
	41372	48324	62437	41672	47726	47867
	34027	78772	24167	32171	68783	87716
	18764	46724	82416	42313	27167	37872
	31241	37862	37137	57717	27178	47132
	61375	41371	41683	87671	37183	41367

9.	41340	41837	41372	41672	41834	41837
	21347	68773	46837	37183	67832	41678
	76827	41701	46713	63784	41786	38678
	48372	37456	48783	32487	67138	32168
	48372	75671	67187	67137	41687	41767
	41671	38716	38147	47183	48371	89168

10.	41071	13716	41371	41372	71324	41674
	60872	41372	62710	48637	67168	34187
	41876	67187	04701	24873	32417	62184
	86716	47183	37124	21437	63418	67132
	40713	86713	37672	67138	46728	48667
	87241	46713	48372	63418	87832	47183

EXERCISE XI.

1.	370693	732894	567126	776655	764845
	777777	555123	432733	667755	999999
	531234	456789	567643	554488	888888
	135789	579646	219872	998877	777777
	973124	843757	876464	776654	666666
	76383	984329	597777	897987	245678
	567890	432173	66466	764896	457896

2.	348037	460375	963172	849652	962847
	272465	841681	300725	361728	777888
	530634	239724	463248	412381	888999
	109871	763256	721003	635403	789789
	693036	437891	387356	872545	678678
	764543	825432	241653	406223	897987
	233638	285678	603280	294867	387647
	428432	310720	532176	811236	486578

3.	389763	403521	278321	576037	364728
	210045	687489	829248	213744	246374
	760806	324061	171320	764368	478369
	636215	530724	206782	305216	287456
	253734	623452	461027	436720	936478
	251600	487638	589203	823284	184369
	575453	290731	248639	217436	678456
	807720	803256	730461	592301	286397
4.	379623	891371	889977	789	8000000
	7542	919198	732894	723	667755
	25320	171296	555123	674	44332
	57644	147867	456013	1674	3355778
	908176	182371	579646	19006	986754
	73409	929292	843751	1916	71347
	3147	292929	984329	986986	981675
	67039	777777	432173	97979	19198
5.	3824442	67124332	25927871	3267362	7778889
	4563358	31734324	71684655	2152837	4581986
	1612119	19524324	69351437	4627792	3599872
	5121223	53414325	35927212	3564465	2998767
	8232535	57384327	21614892	2152322	9887651
	6348442	42624329	74321572	4617777	8776548
	3454384	75218671	69987452	3564416	7665434
	2563125	83186438	25654232	2152362	6554326
	4673995	41986974	71381011	4617727	5443213
6.	6739484	87665163	94358975	95639888	99888777
	5263898	57946295	2848	86872569	22586972
	9688626	43937568	9184	11191993	57486976
	7445853	89264339	45339	32384345	21586972
	6899438	2613	987672	95339888	93456975
	8123814	9155	93783891	85372569	46556972
	4598603	5278	26753984	14891173	25496977
	2355792	87667549	66344839	36684845	47556979
	1773424	49623	94982172	71739188	21457979
7.	4008811	31412	657118	294044	95299
	1854239	30088	182595	199639	8720834
	705	150	5520	17228	436292
	14872	1500	525	17370	400283
	6498119	5363277	497454	41762	2344900
	1055308	3187	57768	482511	12137980
	371498	18015	23247	1027	11089359
	4640559	46976	990019	1088534	3633750
	12526543	1278225	2150113	9414575	295984

8.	12881535	624564	2610287	6214458	131917
	2171188	209840	373898	1530581	3400717
	9947523	213954	2297433	2142822	2860765
	683069	1957	109897	417	253963
	9243811	2434454	1364034	296259	71894
	3086160	3975	477438	4494680	41729
	8071370	7088142	585138	31211	535955
	7065878	1011492	2043283	4925889	11212616
	4346234	21191	559619	137990	4286131
	7834359	203572	1627164	2981652	517562

9.	6967056	3196563	1108476	185658	57636799
	9487210	365756	375396	1601190	63927094
	79766094	49741413	10071301	13121498	19154873
	4146290	95921	970738	2130102	25981652
	34449379	20819542	10196371	14487351	71653431
	39878418	2505034	4481570	15367691	62327299
	995670	316508	129692	49	29987988
	2981850	4970	487233	1066277	75654877
	8139585	177681	1364378	1619386	61321716

10.	8529883	27932143	93789391	22872769	75700757
	3593652	53969235	26745984	75191997	36471241
	9658934	49265558	66357839	96484343	75057906
	6475424	87647389	94946172	81539885	44346505
	3757873	87931693	93787391	12872568	91753002
	3363662	53929135	26782644	35791979	77647300
	8829744	49298258	66359199	96284343	76044071
	2293413	87651589	94945222	81339885	82872633
	7958882	87973397	93787511	12672568	99872517
	8175659	75982231	65781737	35891219	86297761

EXERCISE XII.

1. Add together 763, 4663, 37, 49763, 6178, and 671.
2. Add together 15, 7896, 1, 13, 106, 113, 156, 100, and 2201.
3. Add together 100375, 406780, 4673005, 4112, 2478, 79, and 8.
4. Add together 123405, 2354210, 794327, 36547, and 789.
5. Add together 275602, 345607, 4567801, 365, 1896, and 7869.
6. Add together 76, 189, 3684, 72, 8967, and 798.
7. Add together 982, 369, 764, 8, 89, 75, and 396.
8. Add together 7, 89, 8, 7698, 38, 471, 78, and 1899.
9. Add together 968, 777, 78, 408, 700, 9009, and 7.
10. Add together 7698, 4, 796, 87, 3694, 78, and 897.

EXERCISE XIII.

1. 7634129+7634+830604+937+856312+37140+69471328+8594695.
2. 9093+846295+3700564+57312858+581401+393+4301201.
3. 51316281+7413819+543628+7143+717562+8319886.
4. 79+863+900832+8632+473423+644+1000000.
5. 789632+71+879002+876+970+329449.
6. 92+853+7654+65432+543210+4321098+321976+2109+1098+182.
7. 6290+764+713+4631+5214+289+3102+41.
8. 483+9000+648+3750+9840+24680+5096.
9. 103421538+120952657+116843889+116491051.
10. 82+92+102+873+824683+2000201+489076.

EXERCISE XIV.

1. Find the sum of 27, 36, 45, 52, 87, 29, 16, and 11.

2. A farmer has five fields of grain. In the first there are 27 acres; in the second, 42 acres; in the third, 97 acres; in the fourth, 86 acres; and in the fifth, 102 acres. How many acres are there in the five fields?

3. James has 27 marbles; John has 83; Harry has 116; and Tom 46. How many have they all?

4. James rode 17 miles on Monday, 23 miles on Tuesday, 41 miles on Wednesday, 36 miles on Thursday, 17 miles on Friday, and 24 miles on Saturday. How far did he ride during the 6 days?

5. A farm cost $4816, a house $2345, a horse and buggy $158, and a cow $34. How much did all cost?

6. A drover had 327 sheep, 245 cows, 584 pigs, and 117 horses. How many animals had he in all?

7. In an orchard there are 417 apple trees, 176 peach trees, 245 plum trees, and 47 pear trees. How many trees are there in the orchard?

8. Add 294, 421, 76, 109, and 217 together, and express the result in Roman numerals.

9. In 1897 the population of the County of Oxford was as follows: Townships, 28780; Towns, 15801; Villages, 1810. What was the total population of the county in 1897?

10. To the sum of 14, 17, 25, and 96, add the sum of 18, 12, 19, and 25.

EXERCISE XV.

1. Tom had 17 marbles; he bought 5 more, and his brother gave him 18. How many had he then?

2. A man paid $22 for a suit of clothes; $2 for a hat; $6 for a pair of boots; and $15 for underwear. What did he pay for all?

3. John's book has 216 pages; Mary's, 492; and Harry's, 162. How many pages are there in the three books?

4. A man travelled 247 miles on Monday, 36 miles on Tuesday, and 17 miles on Wednesday. How far did he go in the three days?

5. Find the sum of 47 cents, 93 cents, 107 cents, 483 cents, and 270 cents.

6. Add $128, $1275, $468, $17, and $12.

7. A man spent $127 one day, $47 another, and $96 another. How much did he spend altogether?

8. Edwin had 35 cents; he found 16 cents, and his brother gave him 47 cents. How much had he then?

9. A man wheeled 37 miles on Monday, 46 on Tuesday, 34 on Wednesday, 52 on Thursday, 28 on Friday, and 11 on Saturday. How far did he wheel altogether?

10. A man began business with $3795. His gain the first year was $824; the second, $491; the third, $726; the fourth, $1211; and the fifth, $809. What is he now worth?

EXERCISE XVI.

1. Find the sum of all the numbers, from 749 to 760, inclusive.

2. Three men bought a farm. The first paid $2468; the second, $2032; and the third, as much as the other two. Find the cost of the farm.

3. Ella picked 378 baskets of berries, and Jane picked 58 more than Ella. How many did both pick?

4. A schoolroom is 32 feet long and 21 feet broad. How many feet is it round the room?

5. Willie gave John 37 cents and Mary 48 cents. He had as many cents left as he had given away. How many cents had he at first?

6. A farmer bought a pig for $19, a cow for $39, a sheep for $13, and a horse for as much as he paid for the pig and the cow. How much did he pay for all?

7. My brother gave me 32 cents; my father gave me 8 cents more than my brother, and my mother gave me as much as both. How much money did I receive?

8. Helen spent 117 cents for books, 121 cents for oranges, 44 cents for peaches, 131 cents for sugar, and had 87 cents left. How much had she at first?

9. A farmer has 15 acres of wheat, 29 acres of barley, 17 acres of peas, 19 acres of corn. The rest of the farm is in pasture, and there are as many acres of pasture as of grain. How many acres has he altogether?

10. A drover bought 27 sheep for $115 from one farmer; from a second, he bought 35 sheep for $142; and from a third, 28 sheep for $132. How many sheep did he buy, and how much did they cost him?

EXERCISE XVII.

1. Find the sum of $42, $9136, $254, $29, and $530.

2. At the World's Fair a man spent $37 the first week; $46 the second; $84 the third; and $96 the fourth. His other expenses were $87. How much did he spend during the four weeks?

3. In 1897 the population of the County of Essex was 43154; of Kent, 44183; of Elgin, 29659; of Norfolk, 29231; of Haldimand, 21263; and of Welland, 30305. What was the total population of these six counties?

4. In 1896 the debenture debt of Ontario was as follows: Of townships, $2866904; of towns, $9598063; of villages, $1163096; and of cities, $37471231; of counties, $1848982. What was the total debenture debt of Ontario?

5. A drover bought three flocks of sheep. The first contained 967, the second 133 more than the first, and the third 450 more than the second. How many sheep did he buy altogether?

6. Sarnia is 62 miles west of London: London is 115 miles west of Toronto, and Toronto is 333 miles west of Montreal. How far is it from Sarnia to Montreal?

7. I lost $29 by selling a horse for $71. How much did the horse cost me?

8. For how much must I sell a horse which cost me $91, so as to gain $29?

9. John has 27 cents more than Willie, who has 84 cents. How much money have both together?

10. The first of three numbers is 846, the second is 987, and the third is as much as the other two. Find the sum of the three numbers.

EXERCISE XVIII.

1. A boat sails from St. Catharines to Toronto, 45 miles; from Toronto to Montreal, 335 miles; and from Montreal eastward a distance equal to that from St. Catharines to Montreal. Find the total distance sailed.

2. Add 675, one million and nine, four thousand and six, 302, forty-one thousand six hundred and four, 21436, ninety-seven, 84, and ninety-one thousand four hundred and seven.

3. I bought wheat for $4596, corn for $23475, oats for $8796. I sold the wheat at a gain of $1404, the corn at a gain of $6525, and the oats at a gain of $204. How much did I get for all?

4. After selling 1016085 oranges, a merchant had two lots left, one containing 69756 and the other 85619. How many oranges had he at first?

5. A man sold a horse for $986, and three cows for $680 each. He lost $125 on the horse and $220 on each cow. How much did all cost him?

6. How many times does a clock strike in 12 hours?

7. I bought wheat for $7962, corn for $12649, oats for $8763. I sold the wheat for $780 more than the cost, and the corn and oats at a gain of $1685 on both. How much did I get for all?

8. A lady paid $380 for a piano, $275 more than that sum for furniture, and $2675 for a house, and has still $8375 in the bank. What sum had she at first?

9. A farmer gave to each of his three sons $6580, and to his daughter $920 more than to *two* sons. How much did he give away altogether?

10. A man gave his wife $10560, his two sons $7325 each, and his daughter $485 more than a son's share. How much did he give away?

EXERCISE XIX.

1. In 1897 the population of the townships of Ontario was 1113530; of the towns, 312947; of the villages, 133560; and of the cities, 430940. What was the population of Ontario in that year?

2. In the Battle of Waterloo it is said that of the soldiers engaged 36273 were British, 7447 were Hanoverians, 8000 were Brunswickers, and 21000 were Belgian, whilst there were about 75000 French. How many were there of the four allies, and how many combatants were there altogether?

3. A father leaves an estate to his son, daughter and wife. To his son he leaves 5355 dollars, to the daughter 500 dollars more than to the son, and to the wife 1500 dollars more than to the daughter. What was the amount of the estate?

4. John threw a ball 34 yards up the road, and another 43 yards down the road. How far must he walk to bring them both back again?

5. The first of four numbers is 4768, the second is 179 more than the first, the third is 906 more than the second, and the fourth is as much as the other three. What is the sum of the four numbers?

6. Mary bought a book for which she gave 95 cents; Maude bought one for which she gave 13 cents more than Mary; and Maude's book cost 23 cents less than Jane's. Find the cost of Jane's book.

7. Find the number of days in a year—the days of the respective months being as follows: January 31, February 28, March 31, April 30, May 31, June 30, July 31, August 31, September 30, October 31, November 30, December 31.

8. Adam lived 930 years; Seth, 912; Enos, 905; Cainan, 910; Mahaleel, 895; Jared, 962; Enoch, 365; Methusaleh, 969; Lamech, 777; Noah, 950; Shem, 600; Arphaxad, 438; Salah, 433; Heber, 464; Peleg, 239; Reu, 239; Serug, 230; Nahor, 148; Terah, 205; Abraham, 175; Isaac, 180; Jacob, 147; Joseph, 110; Moses, 120; Joshua, 110. What is the sum of all their ages?

9. Water-mills were invented in the year 555 after Christ; windmills 744 years after water-mills; pumps 126 years after windmills; printing 15 years after pumps; watches 37 years after printing; the spinning-wheel 53 years after watches; the steam-engine 119 years after the spinning-wheel; the fire-engine 14 years after the steam-engine; the spinning-frame 98 years after the fire-engine; and the electro-magnetic telegraph 71 years after the spinning-frame. In what year was the electro-magnetic telegraph invented?

10. A man bequeathed his estate as follows: To each of his two sons, $12450; to each of his three daughters, $6500; to his wife, $650 more than to both the sons; and the remainder, which was $1000 more than he had left to all his family, he gave to benevolent institutions. What was the whole amount of his property?

II. SUBTRACTION.

Subtraction is the process of finding the difference between two numbers of the same kind.

The **Minuend** is the number from which the other number is taken.

The **Subtrahend** is the number which is taken from the minuend.

The **Difference** or **Remainder** is the number found by taking the subtrahend from the minuend.

The sign of Subtraction is —, called *minus*, and when written between two numbers it shows that the number after it is taken from the one before it.

EXERCISE XX.

1.	59 23	67 54	29 16	47 21	96 32	87 52	99 73
2.	786 245	938 412	897 564	984 421	593 242	898 452	
3.	674 52	849 417	928 415	547 236	693 451	989 472	
4.	8947 4312	5986 3241	9397 4152	8946 4235	4918 3807	4765 1234	
5.	70846 50314	89476 13012	91768 40532	59487 23152	49387 29245	39587 21432	
6.	35276 21042	46547 31023	48456 22304	57345 31021	73846 21413	964782 130531	
7.	45987 21257	47543 31213	48653 32423	49735 13425	56347 12345	98764 12321	
8.	38764 32532	74826 50412	45768 42323	54398 51281	64895 62352	78456 32012	

9.	428357	628954	639847	718647	965783
	423142	523412	632123	715415	120321
10.	437968	809087	765347	368718	479684
	312415	304015	765123	123718	412382

EXERCISE XXI.

1. A man had 151 cows. He sold 40 of them. How many had he left?

2. Harriet and Ellen together have 83 little chickens, of which Harriet owns 43. How many belong to Ellen?

3. A man bought a horse for $127 and sold it for $104. How much did he lose?

4. A book has 216 pages. Tom has read 103 pages. How many pages has he yet to read?

5. A merchant having bought 587 gallons of syrup, sold a certain quantity and had 315 gallons left. How many did he sell?

6. A man paid 275 dollars for a horse and buggy; the horse cost 125 dollars. What was the price of the buggy?

7. In one year a merchant sold 1578 barrels of flour and 1324 barrels of sugar. How many more barrels of flour did he sell than sugar?

8. A drover having 1465 sheep sold 233 of them. How many had he remaining?

9. A farmer has two farms containing together 875 acres. In one farm there are 442 acres. How many are there in the other?

10. A farmer bought a farm for $3000 and sold it for $4200. How much did he gain?

EXERCISE XXII.

1.	90	40	50	60	70	80	100
	35	13	27	31	46	29	75

2.	327	936	574	928	726	850
	142	484	381	182	145	160
3.	590	760	406	732	824	751
	143	178	184	185	168	328
4.	3450	3760	4870	5340	5938	9418
	1235	2346	2527	2128	2976	5493

5.	4238 2893	5129 3875	6248 4983	7206 3894	7462 5938	4915 3897
6.	42736 24382	53829 28596	61705 28483	80727 45384	49376 31949	57146 29418
7.	400300 295246	500200 393186	700400 398327	800500 496478	300700 123456	600500 287684
8.	500000 273827	400000 285458	600000 365879	700000 486347	400000 267410	800000 120076
9.	506207 49185	402508 84274	604506 89251	703605 78382	802507 76832	907608 30709
10.	924390 432412	705180 443544	527082 232154	816141 135212	423453 141514	700600 123416

EXERCISE XXIII.

1. From 924 take 379; from 970 take 182.
2. From 1000 take 378; from 1111 take 999.
3. From 2450 take 1097; from 6040 take 644.
4. From 44444 take 14847; from 44444 take 15789.
5. From 50505 take 27895; from 55555 take 48776.
6. From 666666 take 278954; from 600000 take 123007.
7. From 100600 take 99999; from 777777 take 297998.
8. From 486413 take 164184; from 418786 take 219186.
9. From 600078 take 142368; from 300007 take 108819.
10. From 672246 take 487128; from 578472 take 169386.

EXERCISE XXIV.

1. 6005—2347 7825—3569 9012—3684
2. 8002—2636 8412—3756 7064—2768
3. 8003—2746 9000—1234 7000—2546
4. 6005—2748 7018—6243 7000—3748
5. 9004—2615 8765—5999 8000—5318
6. 6003—2846 6200—4756 8000—3526
7. 7035—2648 8006—7184 9000—3725
8. 7023—2896 8574—6497 9000—2745
9. 8021—3472 7482—3597 6324—2538
10. 8064—2397 8100—6718 6245—3789

EXERCISE XXV.

1.	56739—24316	36751—28976	431250—153697
2.	68507—47623	90006—29384	920503—476829
3.	47865—12341	71020—54367	523146—286759
4.	72006—48315	43002—27659	647352—268574
5.	65043—17872	71300—45635	502304—186475
6.	81000—25143	64434—25679	625030—274384
7.	90000—30906	76456—29898	720301—368596
8.	90503—47628	56307—18497	842003—459687
9.	41009—31214	70000—39458	715324—369857
10.	43020—36748	78536—47658	900500—465783

EXERCISE XXVI.

1.	8467321—3478271	7007000—2009001
2.	3178632—1478371	6789012—700999
3.	9004100—30012	76489687—999999
4.	100010110—990991	7000000—636363
5.	49716368—42894938	7400002—123807
6.	3714908—2916409	5000005—900009
7.	37080605—29347165	10101011—303033
8.	23456789—14930768	27689714—9337778
9.	1000000—11	4765879—707070
10.	4000000—199091	5005005—1234567

EXERCISE XXVII.

1. How much must be added to 76 to make 150?

2. Take 713968 from one million.

3. From 9410068 take 3090801.

4. What is the difference between 76104 and 108403?

5. The greater of two numbers is 705, and the difference between them is 29. Find the smaller number.

6. Find the remainder, after taking 7854 as often as possible from 57692.

7. What number taken from one million will leave 473916?

8. To what number must 8764 be added to make 11342?

9. 7900000—467846—764839.

10. From the difference between 287368 and 789560, take 360194.

EXERCISE XXVIII.

1. A man had 374 sheep and sold 285. How many had he left?

2. James has $575; Tom has $318. How much more has James than Tom?

3. If a man receives $3415, and spends $2947, how much has he left?

4. If I buy 47964 bushels of wheat and sell 23796 bushels, how many bushels are left?

5. Mr. Jones has $7698 and Mr. Williams $5919. How much more has Mr. Jones than Mr. Williams?

6. I bought a farm for $7916 and have paid $5748. How much do I still owe for the farm?

7. A owed B $378 and paid him $329, and gave him a cow for the balance. What was the value of the cow?

8. A man started to walk 3400 miles, and has finished 1968 miles. How far has he yet to go?

9. In 1897 the population of Ontario was 1990977; in 1886 it was 1828495. How much had the population increased during this period?

10. In 1897 there were 940236 milk cows in Ontario; in 1888 there were 781559. How many milk cows had been added to the cattle of Ontario during this period?

EXERCISE XXIX.

1. A merchant sends $4796 to his agent to buy goods, and receives $3989 worth. How much does the agent keep?

2. James bought 98 marbles and then sold 59 of them. How many had he left?

3. In an army of 24907 men, there are 10908 who are over 36 years of age. How many are younger?

4. I sold a farm for $4713 and gained $897. What did it cost me?

5. There are 525600 minutes in a year, and 173964 in the first four months. How many minutes are there in the rest of the year?

6. Jane has two books containing 736 pages, and one has 297. How many has the other?

7. A railway cost $63475916, and of that sum $41968959 have been paid. How much is still owing?

8. A boy starts from Montreal for Vancouver, a distance of 14680000 feet, and travels 8379164 feet. How far has he yet to go?

9. In 1897 there were 312947 persons in Ontario living in towns, and 430940 living in cities. How many more persons lived in cities in Ontario than in towns?

10. In Ontario in 1883 there were 53513032 pounds of cheese manufactured, and in 1897 137362916 pounds. How many more pounds were manufactured in 1897 than in 1883?

EXERCISE XXX.

1. A boy paid 52 cents for a geography and 25 cents for an arithmetic. How much more did he pay for the geography than for the arithmetic?

2. A boat had 726 passengers and landed 438 at a port. How many remained on the boat?

3. A man began business with $15264 and lost $3271. How much had he left?

4. A man had $100. He paid $65 for a buggy and the rest for harness. How much did the harness cost?

5. Sir Isaac Newton died in 1727 at the age of 85. When was he born?

6. Gladstone was born in 1809 and died in 1898. To what age did he live?

7. The University of Cambridge was founded in 915. How old was it in 1898?

8. Mount Logan, the highest mountain in Canada, is 19500 feet high. How much higher is it than Mt. Blanc, the highest mountain in Europe, which is 15812 feet high?

9. At an election there were 2784 good ballots cast. The successful candidate received 1459 votes. How many votes were given to the defeated candidate?

10. In 1898 the population of Greater London was 6291000, and of Greater New York it was 2321644. How much did the population of London exceed that of New York?

EXERCISE XXXI.

1. In a school of 489 scholars there are 267 girls. How many more girls than boys are in this school?

2. I bought a house for $2127. I paid $365 for repairs, and then sold it for $2690. How much did I gain?

3. A miller bought 1000 bushels of wheat from one farmer, and 500 bushels from another. After selling 825 bushels to one merchant and 460 to another, how many had he left?

4. A gentleman at his death left 12000 dollars to be divided between his wife, his son and his two daughters. To each of the daughters he gave 2875 dollars, to the son 3000 dollars, and to his wife the remainder. What was the wife's portion?

5. A man bought a horse for $175 and another for $216. He sold both for $423. How much did he gain?

6. A man is worth $175968. Of this $29347 is in real estate; $14743 in bank stock; $23928 in railway bonds, and the rest is in the bank. How much is in the bank?

7. A cattle drover bought cattle for $19376. He paid $8949 in cash, gave a cheque on the bank for $3249, and his note for the balance. For how much was the note drawn?

8. There are 1760 yards in a mile. Find by subtraction how many miles there are in 8937 yards, and how many yards remain.

9. Two persons are 375 miles apart; they travel towards each other; at the end of one day, one has travelled 93 miles and the other 57 miles. How far apart are they still?

10. At an election 12572 votes are taken, of which the successful candidate received 7391. By what majority was he elected?

EXERCISE XXXII.

1. A man deposits in the Ontario Bank 2374 dollars. At one time he draws out 897 dollars, at another time 543 dollars, and at a third time 689 dollars. How much still remains in bank?

2. A man was 21 years old in 1896. In what year will he be 75 years old?

3. A gentleman dying left 4500 acres of land to his wife, his son and his daughter. To his wife he gave 1564 acres, to his son 1449 acres, and to his daughter the remainder. What was the daughter's portion?

4. A gentleman 83 years old has two sons; the age of the older son added to his makes 128 years, and the age of the younger son is equal to the difference between the age of the father and that of the older son. How old is each of his sons?

5. A man bought three estates; for the first he gave $5260, for the second he gave $3585, and for the third he gave as much as for the first two together. He afterwards sold them all for $15280. Did he gain or lose, and how much?

6. James has 25 marbles; John has 32. The first time they played John won 7, but the next time James won 13. How many marbles has each now?

7. On a farm of 112 acres there are 14 acres in wheat, 15 acres in barley, 12 acres in oats, 17 acres in peas, 9 acres in hoed crop, and the rest in pasture and bush. How many acres are in pasture and bush?

8. How many days are there from June 28th to September 5th, inclusive?

9. James and Henry have together 45 marbles; Henry and John have together 63 marbles; John and William have together 81 marbles; William has 45 marbles. How many marbles has James?

10. In 1897 the population of Ontario was 1990977; in 1896 it was 1972286; in 1895 it was 1957390, and in 1894 it was 1936219. By how much did the population increase during 1894, 1895 and 1896 respectively?

EXERCISE XXXIII.

1. From the difference between 17496 and 5378 take the sum of 4125 and 1247.

2. Simplify 2187+374—1763+9436—1479+8161—3948.

3. The sum of three numbers is 2897. One of these is 794, another is 497. Find the other.

4. What must be added to 1000000—6093 to give 3746918—94786?

5. The sum of six numbers is 40917. Five of them are 4876, 9127, 4763, 8294, and 7328. What is the sixth number?

6. What number added to the sum of 7089, 987, 3469, 58732, 29 and 4336, will make one million?

7. What number must be taken from the difference between 3789 and 7968 to leave 1645?

8. What number added to 1271 will give the sum of 40370, 3684 and 30916?

9. From the sum of all the odd numbers between 436 and 448 take the difference between 39476 and 38979.

10. The subtrahend is the sum of 784, 965, and 1894. The minuend is the difference between 7689 and 19785. Find the remainder.

11. The sum of four numbers is 45364. The first number is 5215, the second is 457 more than the first, and the third is 128 less than the first and second together. Find the fourth number.

12. The remainder is 7894 after 9462 has been subtracted 7 times from a certain number. Find the number.

III. MULTIPLICATION.

Multiplication is the process of finding the sum of a number called the *multiplicand*, repeated as many times as there are units in another number called the *multiplier*.

The Multiplicand is the number to be multiplied.

The Multiplier is the number by which the multiplicand is to be multiplied. It shows how often the multiplicand is to be repeated as an addend.

The Product is the result of the multiplication.

The *multiplier* and the *multiplicand* are called the **Factors** of the product.

THE MULTIPLICATION TABLE.

Twice	Three times	Four times	Five times	Six times	Seven times
1 is 2	1 is 3	1 is 4	1 is 5	1 is 6	1 is 7
2 . . 4	2 . . 6	2 . . 8	2 . . 10	2 . . 12	2 . . 14
3 . . 6	3 . . 9	3 . . 12	3 . . 15	3 . . 18	3 . . 21
4 . . 8	4 . . 12	4 . . 16	4 . . 20	4 . . 24	4 . . 28
5 . . 10	5 . . 15	5 . . 20	5 . . 25	5 . . 30	5 . . 35
6 . . 12	6 . . 18	6 . . 24	6 . . 30	6 . . 36	6 . . 42
7 . . 14	7 . . 21	7 . . 28	7 . . 35	7 . . 42	7 . . 49
8 . . 16	8 . . 24	8 . . 32	8 . . 40	8 . . 48	8 . . 56
9 . . 18	9 . . 27	9 . . 36	9 . . 45	9 . . 54	9 . . 63
10 . . 20	10 . . 30	10 . . 40	10 . . 50	10 . . 60	10 . . 70
11 . . 22	11 . . 33	11 . . 44	11 . . 55	11 . . 66	11 . . 77
12 . . 24	12 . . 36	12 . . 48	12 . . 60	12 . . 72	12 . . 84

Eight times	Nine times	Ten times	Eleven times	Twelve times
1 is 8	1 is 9	1 is 10	1 is 11	1 is 12
2 . . 16	2 . . 18	2 . . 20	2 . . 22	2 . . 24
3 . . 24	3 . . 27	3 . . 30	3 . . 33	3 . . 36
4 . . 32	4 . . 36	4 . . 40	4 . . 44	4 . . 48
5 . . 40	5 . . 45	5 . . 50	5 . . 55	5 . . 60
6 . . 48	6 . . 54	6 . . 60	6 . . 66	6 . . 72
7 . . 56	7 . . 63	7 . . 70	7 . . 77	7 . . 84
8 . . 64	8 . . 72	8 . . 80	8 . . 88	8 . . 96
9 . . 72	9 . . 81	9 . . 90	9 . . 99	9 . . 108
10 . . 80	10 . . 90	10 . . 100	10 . . 110	10 . . 120
11 . . 88	11 . . 99	11 . . 110	11 . . 121	11 . . 132
12 . . 96	12 . . 108	12 . . 120	12 . . 132	12 . . 144

EXERCISE XXXIV.

1.	3040204 2	4302432 2	423042 2	340243 2	3204302 2
2.	974234 2	4963241 2	879716 2	9847456 2	7084567 2
3.	768064 2	578467 2	708096 2	598746 2	967865 2
4.	863428 2	768497 2	700608 2	367496 2	784967 2
5.	3456454 3	3454645 3	4543456 3	6534356 3	3545464 3
6.	8768475 3	9647364 3	8769456 3	9484965 3	7899486 3
7.	3404134 4	634243 4	4137404 4	1678343 4	6783437 4
8.	5437489 4	6789013 4	978649 4	345987 4	4139764 4
9.	230456 5	5432061 5	3475264 5	2536472 5	1234567 5
10.	4597045 5	9682469 5	7893086 5	7080904 5	7684963 5
11.	5789645 5	8950694 5	5478946 5	4897649 5	8647649 5
12.	3741064 6	34071064 6	3718643 6	41890701 6	4196804 6

EXERCISE XXXV.

1.	4375786 6	6892465 6	5080706 6	3689427 6	7846952 6
2.	7890965 6	4709647 6	8490796 6	6894579 6	8877996 6
3.	7456948 7	7645693 7	8456784 7	9069078 7	7684905 7
4.	245678 7	3742564 7	5420634 7	4253642 7	7006457 7
5.	4087906 7	4087054 7	3090874 7	4897654 7	9876543 7
6.	3642054 8	3246065 8	4604563 8	2345635 8	4352673 8
7.	4794086 8	8887656 8	9234567 8	7896543 8	6700809 8
8.	7684967 8	2563128 8	1536211 8	3306525 8	5016323 8
9.	1234565 9	5643264 9	2073465 9	4234567 9	5764507 9
10.	3064789 9	6478975 9	8090403 9	5468795 9	7864087 9
11.	1760689 9	5311695 9	3155093 9	1534091 9	5135491 9
12.	7689745 10	7000068 10	9506078 10	5678943 10	7684796 10

EXERCISE XXXVI.

1. Multiply 378641783 by 2, by 3, by 4, by 5, by 6, by 7.
2. Multiply 478600324 by 2, by 3, by 4, by 5, by 6, by 7.
3. Multiply 378641834 by 2, by 3, by 4, by 5, by 6, by 7.
4. Multiply 468371834 by 2, by 3, by 4, by 5, by 6, by 7.
5. Multiply 891800347 by 4, by 5, by 6, by 7, by 8, by 9.
6. Multiply 607890195 by 4, by 5, by 6, by 7, by 8, by 9.
7. Multiply 867834079 by 5, by 6, by 7, by 8, by 9, by 10.
8. Multiply 678341869 by 5, by 6, by 7, by 8, by 9; by 10.
9. Multiply 478378065 by 5, by 6, by 7, by 8, by 9, by 10.
10. Multiply 418347846 by 5, by 6, by 7, by 8, by 9, by 10.

EXERCISE XXXVII.

What are the factors of 15? of 21? of 28? of 42? of 35?

1. Multiply 4879 by the factors of 15, of 28, of 18, of 35.
2. Multiply 6785 by the factors of 14, of 18, of 25, of 42.
3. Multiply 7086 by the factors of 32, of 36, of 42, of 49.
4. Multiply 9584 by the factors of 21, of 45, of 49, of 54.
5. Multiply 2539 by the factors of 24, of 25, of 36, of 63.
6. Multiply 6407 by the factors of 32, of 45, of 54, of 72.
7. Multiply 7685 by the factors of 48, of 50, of 60, of 70.
8. Multiply 9685 by the factors of 70, of 80, of 90, of 100.
9. Multiply 7689 by the factors of 45, of 54, of 63, of 81.
10. Multiply 4875 by the factors of 30, of 40, of 50, of 60.

EXERCISE XXXVIII.

1. Multiply 78546 by 21, by 31, by 41, by 51, by 71.
2. Multiply 68095 by 61, by 71, by 81, by 91, by 19.
3. Multiply 78967 by 13, by 17, by 19, by 29, by 37.
4. Multiply 64758 by 78, by 87, by 95, by 64, by 59.
5. Multiply 47896 by 234, by 345, by 456, by 579.
6. Multiply 97640 by 567, by 892, by 347, by 638.
7. Multiply 90070 by 325, by 257, by 689, by 976.
8. Multiply 76847 by 306, by 405, by 708, by 704.
9. Multiply 98764 by 4008, by 7006, by 5009, by 9040.
10. Multiply 87009 by 5090, by 7080, by 7096, by 9007.

EXERCISE XXXIX.

1. A train runs 25 miles an hour. How far does it run in 48 hours?

2. Mr. Brown has 1565 horses. What are they worth at $125 each?

3. How many ounces are there in 37968 pounds, if there are 16 ounces in one pound?

4. The earth in its annual journey around the sun moves about 68000 miles an hour. How far does it move in a day, or 24 hours?

5. Find the cost of 7896 yards of cotton at 8 cents a yard.

6. In a grove there are 9 rows of trees and 78 trees in each row. How many trees are there in the grove?

7. How far can a horse travel in 365 hours at the rate of 8 miles an hour?

8. How many hills of corn are there in a field containing 426 rows, and 224 hills in a row?

9. What will 65 miles of plank-road cost at 2007 dollars per mile?

10. How many lemons are there in 243 boxes, each box containing 309 lemons?

EXERCISE XL.

1. A merchant bought 1275 barrels of sugar of 300 pounds each at 4 cents a pound. Find the cost of the sugar.

2. A merchant bought 27 bales of cloth, each bale containing 33 pieces, and each piece containing 36 yards. How many yards were there in all?

3. How many nails will it take to shoe 74 horses, if there are 8 nails in each shoe?

4. How far will a train go in 87 days at 30 miles per hour? (1 day=24 hours).

5. How many inches are there in 4756 yards, there being 3 feet in a yard and 12 inches in a foot?

6. A man buys 4795 pounds of tea at 5 cents an ounce. What did he pay for it? (16 ounces=1 pound).

7. Find the cost of 78 bales of cotton, each bale containing 412 yards at 15 cents per yard.

8. Find the value of 68 farms of 120 acres, each at $25 per acre.

9. There are 60 minutes in an hour and 24 hours in a day. How many minutes are there in 365 days?

10. The *Montreal Star* has a daily circulation of 146819 copies. How many papers will be sent out in 6 weeks of 6 days each?

EXERCISE XLI.

1. Multiply the sum of all the odd numbers between 36 and 46 by the sum of all the even numbers between 37 and 47.

2. A drover bought 4793 cattle at $45 each, and 491375 sheep at $5 each. How much more did the sheep cost than the cattle?

3. A farmer sold 25 cords of wood at $3 per cord and received in payment four $20 bills. What change must he give back?

4. Find the amount of the following bill:—

14 pounds rice at 4 cents a pound.
8 yards cotton at 7 cents a yard.
19 spools thread at 4 cents a spool.
73 pounds sugar at 5 cents a pound.

5. A drover bought 124 cows at $57 each, and 79 horses at $96 each. How much more did the horses cost than the cows?

6. The drover sold the cows in last question at a gain of $13 each, and the horses at a loss of $20 each. Did he gain or lose, and how much?

7. A merchant bought 4736 turkeys in London at 75 cents each, and sent them to Montreal at a cost of 5 cents each. Here he sold them for $4736. How much did he gain on the transaction?

8. A merchant had 793 yards of cloth. He sold 120 yards to one man and 364 yards to another. What is the remainder worth at 8 cents a yard?

9. Two persons start from the same point, and travel in opposite directions. One travels 29 miles a day, and the other 32 miles a day. How far apart will they be in 17 days?

10. A drover bought 127 head of cattle at $34 a head, and 97 head at $47 a head, and sold the whole lot at $40 a head. What was his entire profit or loss?

EXERCISE XLII.

1. The two factors of a certain number are 428 and 403. What is the number?

2. The three factors of a certain number are 187, 29, and 43. What is the number?

3. Find the continued product of 11, 13, 17, 19, and 23.

4. One of the three equal factors of a number is 407. Find the number.

5. The multiplicand is 40009 and the multiplier is the number whose factors are 5, 7, and 11. Find the product.

6. The multiplicand is the difference between one million and one thousand and one. The multiplier is the sum of 407, 709, and 903. Find the product.

7. The difference between two numbers is the product of 407 and 305. The smaller of the two numbers is 100100. Multiply the larger number by 5009.

8. The difference between two numbers is 5007. The greater number is the product of 7005 and 9008. Find the smaller number.

9. How much must be taken from the product of 507 and 735 to get the product of 507 and 635?

10. From the sum of 95×87 and 76×98, take the difference between 78×87 and 97×85.

EXERCISE XLIII.

1. Multiply the sum of 1206 and 7579 by their difference.

2. How much is the product of 579 and 758 greater than the product of 577 and 758?

3. Multiply together all the numbers that end in 3, 5, 7, or 9, between 12 and 20.

4. Multiply the greatest number that can be expressed by four figures by the greatest one expressed by three figures.

5. From the product of 9009 and 7007, take the product of 7090 and 7909.

6. If Mr. Brown owns 3 houses, the first worth $2783, the second 3 times, and the third 7 times as much as the first, what are the 3 houses together worth?

7. A drover bought a drove of 33 oxen, paying as many dollars for each ox as there were oxen in the drove. He paid $514.85, and gave his note for the balance. For how much does he give his note?

8. The area of Ireland is 32535 square miles, and 5096490 acres are cultivated. How many acres are uncultivated, there being 640 acres in a square mile?

9. A field of oats has 19 rows of stooks; each row has 37 stooks in it, and there are 12 sheaves in a stook. How many stooks are in the field? How many sheaves?

10. The sum of 4 numbers is 20000; three of them are 4785, 5769, and 2807. Multiply the sum of the greatest and least by the sum of the other two.

IV. DIVISION.

Division is the process by which, when the *product* and *one factor* are given, *the other factor* is found.

The Dividend, the given product, is the number to be divided.

The Divisor, the given factor, is the number by which the dividend is to be divided.

The Quotient, the factor to be found, is the result of the division.

The Remainder is what is over when the dividend does not contain the divisor an exact number of times.

Thus, **The Dividend** is equal to the product of the *Divisor* and *Quotient*, increased by the *Remainder*.

The sign of *Division*, written ÷, shows that the number preceding it is to be divided by the number following it.

EXERCISE XLIV.

NOTE.—It is recommended that this exercise be worked by the Long Division plan.

1.	24÷2	46÷2	96÷2	84÷2
2.	468÷2	472÷2	836÷2	946÷2
3.	963÷3	699÷3	687÷3	876÷3
4.	484÷4	568÷4	736÷4	624÷4
5.	585÷5	635÷5	205÷5	745÷5
6.	618÷6	366÷6	486÷6	960÷6
7.	749÷7	847÷7	574÷7	945÷7
8.	968÷8	840÷8	928÷8	728÷8
9.	819÷9	918÷9	729÷9	360÷9
10.	4568÷8	7389÷9	5243÷7	2709÷9

EXERCISE XLV.

1.	2)428642	2)208462	2)242680	2)424826	2)462860
2.	2)157996	2)135794	2)351792	2)537958	2)315970
3.	3)396069	3)156945	3)463716	3)864957	3)745683
4.	4)534768	4)784724	4)813492	4)674508	4)562732
5.	5)184760	5)501035	5)741800	5)357185	5)927650

6. 6)684756 6)612342 6)841752 6)931476 6)700002

7. 7)714812 7)945707 7)584766 7)321461 7)631043

8. 8)728128 8)914640 8)891360 8)741232 8)148536

9. 9)214731 9)834561 9)475362 9)684783 9)548379

10. 8)810248 9)903654 9)748539 7)123459 7)934766

EXERCISE XLVI.

1. Divide 4178634 by 2, by 3, by 4, by 5, by 6, by 7, by 8.
2. Divide 6703406 by 2, by 3, by 4, by 5, by 6, by 7, by 8.
3. Divide 4067867 by 2, by 3, by 4, by 5, by 6, by 7, by 8.
4. Divide 6783867 by 2, by 3, by 4, by 5, by 6, by 7, by 8.
5. Divide 4167086 by 3, by 4, by 5, by 6, by 7, by 8, by 9.
6. Divide 4078603 by 3, by 4, by 5, by 6, by 7, by 8, by 9.
7. Divide 3070642 by 3, by 4, by 5, by 6, by 7, by 8, by 9.
8. Divide 3070412 by 4, by 5, by 6, by 7, by 8, by 9, by 10.
9. Divide 4012678 by 4, by 5, by 6, by 7, by 8, by 9, by 10.
10. Divide 3070864 by 4, by 5, by 6, by 7, by 8, by 9, by 10.

EXERCISE XLVII.

1. At \$3 per yard, how many yards of silk can be bought for \$48? For \$84? For \$132? For \$264?

2. Divide \$968 equally among 8 persons.

3. If I buy 12 horses for \$900, how much will one horse cost?

4. If flour costs \$8 a barrel, how many barrels can be bought for \$2632?

5. A grocer packed 994 pounds of butter in 7 tubs of equal size. How many pounds did he put into each tub?

6. Seven bales of cotton weighed 3668 pounds. What was the average weight per bale?

7. If 5 carloads of iron weigh 75325 pounds, what would be the average weight of one carload?

8. In 1 peck there are 8 quarts. How many pecks are there in 4256 quarts?

9. A ship worth \$38125 was owned in equal shares by 5 men. Find the share of each.

10. At six dollars a ton, how many tons of coal can be bought for \$2274?

EXERCISE XLVIII.

1. A ship sailed across the Atlantic Ocean, a distance of 2880 miles in 6 days. How far did it sail each day?

2. In one mile there are 5280 feet. How many yards are there in a mile, there being 3 feet in one yard?

3. The wages of 8 men for one week were 104 dollars. How much did each earn per week?

4. How long will a bicycle rider who goes at the rate of 9 miles per hour take in going 117 miles?

5. Find the price of a dozen oranges at two for five cents.

6. A drover bought 11 head of cattle for 352 dollars. What was the price per head?

7. An excursion train consisted of five passenger cars and carried 285 persons. What was the average number of passengers in a car?

8. If a locomotive runs 2896 miles in 8 days, what is the average run per day?

9. The sun is 93000000 miles from the earth. Light travels this distance in about 8 minutes. What is the velocity of light?

10. Four farthings make a penny. How many pence are there in 22568 farthings?

EXERCISE XLIX.

1. Divide 62254 by 51, by 61, by 71, by 81, by 91.
2. Divide 17253 by 31, by 41, by 71, by 81, by 91.
3. Divide 127551 by 41, by 51, by 61, by 81, by 101.
4. Divide 105243 by 61, by 71, by 81, by 91, by 301.
5. Divide 594136 by 401, by 801, by 901, by 506, by 704.
6. Divide 471582 by 301, by 501, by 201, by 607, by 809.
7. Divide 695847 by 611, by 721, by 821, by 541, by 441.
8. Divide 437650 by 531, by 651, by 751, by 654, by 885.
9. Divide 964375 by 825, by 925, by 795, by 333, by 555.
10. Divide 764578 by 972, by 492, by 954, by 876, by 385.

EXERCISE L.

1. Divide 987654 by 912, by 922, by 934, by 975, by 942.
2. Divide 785469 by 845, by 876, by 889, by 892, by 875.
3. Divide 876549 by 777, by 786, by 795, by 799, by 789.
4. Divide 987654 by 678, by 689, by 695, by 699, by 697.

5. Divide 785967 by 568, by 587, by 596, by 589, by 598.
6. Divide 700080 by 485, by 496, by 491, by 478, by 497.
7. Divide 876497 by 367, by 378, by 389, by 399, by 396.
8. Divide 700000 by 285, by 296, by 278, by 294, by 289.
9. Divide 1000000 by 49, by 38, by 29, by 17, by 19, by 37.
10. Divide 1234567 by 13, by 17, by 18, by 19, by 29, by 39.

EXERCISE LI.

1. Divide 173255 by the factors of 15; of 18; of 21; of 25.
2. Divide 876456 by the factors of 24; of 30; of 36; of 42.
3. Divide 954768 by the factors of 45; of 54; of 56; of 63.
4. Divide 743645 by the factors of 25; of 32; of 36; of 40.
5. Divide 875976 by the factors of 32; of 35; of 42; of 54.
6. Divide 900007 by the factors of 36; of 42; of 72; of 81.
7. Divide 397486 by the factors of 30; of 40; of 50; of 60.
8. Divide 786978 by the factors of 60; of 70; of 80; of 90.
9. Divide 987641 by the factors of 100; of 200; of 300; of 400.
10. Divide 987685 by the factors of 500; of 600; of 700; of 800.

EXERCISE LII.

1. Divide 470880 by 6 times 12.

2. Divide 337103025 by 861.

3. How often is 77 contained in 37704821?

4. Divide 7364063 by 7 times 7.

5. Divide 888888 by the continued product of 3, 7, 8, and 11.

6. By what number must 129546 be divided that the quotient may be 27?

7. Divide the continued product of 12, 5, 183, 18 and 70 by the continued product of 3, 14, 9, 5, 20, and 6.

8. The product of two numbers is 2177280; one of them is the continued product of all the even numbers between 5 and 13. Find the other number.

9. What number besides 7087 will exactly divide 68070635?

10. When a certain number is divided by 478, the remainder is 205 and the quotient the same as the divisor. Find the dividend.

EXERCISE LIII.

1. The distance from Montreal to Vancouver is 2948 miles. How long will it take a man to walk the distance at 22 miles per day?

2. If $34051 is equally divided among 17 men, what sum will each receive?

3. A mile contains 63360 inches. How many steps of 24 inches each will a boy take in walking a mile?

4. How many pounds of 16 ounces each are there in 473648 ounces?

5. A man paid $15134 for cattle at $23 each. How many head did he buy?

6. In 42 acres there are 6720 square rods. How many square rods are there in one acre?

7. If a steamship sails 11445 miles in 35 days, what is the average speed per day?

8. The area of a country is 8315 square miles, and the population is 2286625. How many people are there to each square mile?

9. If 2800 sacks of coffee weigh 470400 pounds, what is the average weight per sack?

10. If 1 man can finish a work in 261 days, how long would 29 men require to do the work?

EXERCISE LIV.

1. There are 320 rods in a mile. How many miles are there in 57280 rods?

2. There are 36 inches in a yard. How many yards are there in 3489624 inches?

3. How many miles are there in 33440 yards, there being 1760 yards in one mile?

4. There are 48 pounds in a bushel of barley. How many bushels are there in a load of barley of 3072 pounds?

5. A farmer brought 3060 pounds of potatoes to market. How many bushels had he, there being 60 pounds in each bushel of potatoes?

6. In a bin of oats there are 8330 pounds. How many bushels are there in the bin, there being 34 pounds in each bushel of oats?

7. There are 160 acres of land in a quarter section. How many quarter sections are there in a township containing 23040 acres?

8. A cubic yard contains 27 cubic feet. How many cubic yards are there in a heap of earth containing 2025 cubic feet?

9. There are 196 pounds in a barrel of flour. How many barrels are there in 40572 pounds of flour?

10. A pile of wood contains 90112 cubic feet. How many cords are there in it, there being 128 cubic feet in one cord of wood?

EXERCISE LV.

1. How many times can 78 be taken from the continued product of 13×7×102?

2. Find the sum of all the numbers between 90 and 180 that are exactly divisible by 13.

3. Divide the sum of 4077, 396, and 87491, by the difference between 6384 and 7492.

4. Find the value of 36984×27396÷761.

5. What is the true remainder when 694725 is divided by the factors of 105?

6. How often can you take the sum of the even numbers between 241 and 253 from forty thousand and fourteen.

7. If 213×84×190×264 be divided by 30×56×36, what will the quotient be?

8. When 829653 is divided by 1022, the remainder is 811. What is the quotient?

9. Divide 41579 by the factors of 42, and find the true remainder.

10. The quotient of one number by another is 74; the divisor is 321, and the remainder is 95. What is the dividend?

EXERCISE LVI.

1. The divisor is 77; the quotient is 97; there is no remainder. Find the dividend.

2. The dividend is 632; the quotient is 27; the remainder is 11. What is the divisor?

3. The divisor and quotient are equal to each other, each being 794 and the remainder is the largest possible. Find the dividend.

4. The divisor is 801; the quotient is 403, and the remainder the largest possible. Find the dividend.

5. The divisor is the difference between 204 and 238; the quotient is their sum, and the remainder is the largest possible. Find the dividend.

6. Find the least number which must be added to 17634 to make it exactly divisible by 236.

7. What number besides 364 will exactly divide 89180?

8. Of what number is 345 both divisor and quotient?

9. When 169 is added to the dividend it is exactly divisible by 785, the quotient being 978. Find the dividend.

10. Find the smallest number which, subtracted from 78654, will make it exactly divisible by 458.

V. MISCELLANEOUS EXERCISES.

EXERCISE LVII.

1. The playground is 93 steps long and 47 wide. How many steps will a boy take in going around it three times?

2. From 47926 take 38219, and to the result add 4961.

3. Simplify 487 + 196 + 14732 — 1984 — 4756 + 1734 — 1896 + 4111412—1739648.

4. Find the value of 761+276—849+98—121—317+963+438.

5. Multiply 68754 by 6 and by 8, and add the products.

6. Multiply 59846 by 108 and by 105, and subtract the products.

7. In a mile there are 1760 yards. How many inches are there in 4 miles? (12 inches=1 foot; 3 feet=1 yard).

8. Multiply 500302 by 40102.

9. Divide 275264 by 736, and multiply 456978 by 78, and subtract one result from the other.

10. Find the amount of the following bill:

473 yards cotton at 7c. a yard.
916 pounds tea at 40c. a pound.
19 pounds raisins at 11c. a pound.

EXERCISE LVIII.

1. Multiply seventeen thousand nine hundred and forty-three by 5079.

2. A person earned $85 a month and spent $2 a day. How much did he save in 1896?

3. A number divided by 243 gives 4713 for quotient and 89 for remainder. Find the number.

4. How many times is the product of 75 and 109 contained in the sum of 2063014, 17005000, 469, 30214707, and 3885?

5. Find a number which multiplied by 369 will give the same product as 615 × 18357.

6. What number multiplied by 86 will give the same product as 163 × 430.

7. Find the quotient when the product of 86947 and 248 is divided by 217.

8. A man bought 52 horses at $75 each, and 214 pigs at $11 each. How much more than $6000 did all cost?

9. The divisor is 4736, the quotient 299, and the remainder the largest number possible. What is the dividend?

10. A grocer bought 16 cheese each weighing 70 pounds for 10080 cents, and sold it at 11 cents a pound. How much did he gain?

EXERCISE LIX.

1. A carpenter engages 4 men at $2 each per day. How much will they earn in 7 weeks?

2. A farmer owes his grocer 2646 cents; he gives in payment 147 pounds of butter. What is the butter valued at per lb.

3. A drover sold 495 sheep and 275 lambs for $3300; he received $3 apiece for the lambs. How much did he get for each sheep?

4. A man bought ducks at 47 cents each and sold them at 100 cents a pair. What did he pay for the ducks which he sold for 2800 cents?

5. A man bought 5 pounds nails at 4c. a pound; 5 gallons of oil at 16 cents per gallon; a stove for $15 and an axe for $2. How much change will he get out of a $20 bill?

6. A man bought a horse for $75 and then exchanged it for 9 sheep and $62. If a sheep is worth $7 find his gain?

7. If I give $7830 for 90 head of cattle and sell them at $105 each. How much is the gain?

8. A farmer sold 97 cattle at $65 each, and with the money bought sheep at $13 each. How many did he buy?

9. What number divided by 3008 gives 3875 for quotient and 1397 for remainder?

10. A man earns $75 a month and spends $50 a month, how long will it take him to pay for 60 acres at $40 an acre?

EXERCISE LX.

1. A certain number was divided by the factors of 35; the quotient was 72, the first remainder 2 and the last remainder 6. What is the number?

2. I bought 28 barrels of sugar, each weighing 310 pounds net, at 1200c. a barrel and sold it at 6c. a pound. Find the gain?

3. Two pieces of cloth of equal length cost 5600c. and 7600c. respectively; the first piece cost 70 cents a yard, find the price per yard of the second piece?

4. What is the least number that must be added to 10000000 to make the sum exactly divisible by 653?

5. A number was divided by the factors of 77, the quotient was 137, the first remainder 9, the second 6. What is the dividend?

6. A farmer exchanged 162 bushels of wheat at 160c. per bushel for 27 barrels of flour. What was the value of flour per barrel?

7. A grocer bought 126 pounds of tea at 68c. a pound. He kept 18 pounds and sold the rest at 80 cents a pound How much more money did he receive than he paid out?

3. A drover bought 127 cattle at $50 each, and 93 more at $45 each. He lost 1 of the first lot and 2 of the second, and sold all the rest at $65 each. Find his gain.

4. A train starts from Toronto for Quebec, 516 miles away, at 22 miles per hour. At the same time another starts from Quebec for Toronto at 21 miles per hour. How far from Toronto will they meet?

5. A man earns $1180 per year. He spends $348 during the year. How much does he save per week if 52 weeks make a year?

6. A newsboy buys 120 papers at 2 cents each and sells them all at 2 for 8 cents. How much does he gain?

7. A wagon loaded with coal weighs 2612 pounds. The wagon alone weighs 1112 pounds. If the load is worth 450 cents, what will be the cost of a ton of 2000 pounds?

8. In a stack of hay there are 23688 pounds. A buys it at $15 per load of 2632 pounds. How much is the stack worth?

9. Multiply the greatest of the following numbers by the least, and divide the product by the other number: 324, 510, 108.

10. A merchant was in business 17 years. He gained $2240 a year during the first 6 years and $3036 a year afterwards. What was his whole gain?

EXERCISE LXV.

1. From the sum of 47916, 842, 4983 and 1714, take 47168; multiply the remainder by 184, and divide the result by 46.

2. If 75 bushels of wheat cost 6375c., for how much must I sell 63 bushels to gain 252c. on what is sold?

3. A grocer gave 153 barrels of flour at 900c. a barrel for 81 barrels of sugar of 170 pounds each. What did sugar cost per pound?

4. The product of three numbers is 7650, and the product of two of them is 450. What is the other number?

5. A man gave 50 geese and 35 turkeys for 55 bushels of wheat at 100c. a bushel. If turkeys are worth 90c. each, what are geese worth?

6. If 65 bushels of wheat cost 8450c., what should 195 bushels cost, when the price has fallen 20c. a bushel?

7. A grocer pays 20864c. for syrup at 128c. per gallon. Some leaks out, and the rest is sold for 25920c. at 180c. per gallon. How many gallons leaked out?

8. A drover bought 68 cattle at $47 each. He sold half of them at $54 each and the rest at $45 each. How much did he gain?

9. A merchant bought 48 yards cloth at 62 cents a yard and 81 yards at 75c. a yard. He sold the first lot at 81c. a yard and the latter at 89c. a yard. Find his total gain.

10. If 19 horses and 28 cows are worth $2623, and 11 horses are worth $935, find the value of 13 cows.

EXERCISE LXVI.

1. How many 5-cent pieces are there in 175c.+119c.+101c. +205c.?

2. How many half-dollar pieces are there in 1710c.+2940c. +1525c.+1775c.?

3. How much greater is 18 times $1654 than 9 times $3307?

4. A person bought a number of cows at $38 each and as many horses at $96 each. He paid $2814 for all. How many of each did he buy?

5. If 120 feet of lumber cost 240c., what will 900 feet cost?

6. If 17 tons of hay cost $204, how many stacks of hay, each containing 9 tons, can be bought for $1188?

7. A merchant bought 67 pieces of cloth of 94 yards each at 240c. a yard. He sold it all at 288c. a yard. How much did he gain?

8. A farmer bought land at $49 per acre and an equal quantity at $78 per acre. He paid altogether $31750. How many acres did he buy?

9. If 17 yards of silk cost 5100c., how many bushels of potatoes at 55 cents a bushel must be given for 11 yards of silk?

10. If 5 hats cost as much as 9 pairs of gloves, and one pair of gloves cost 125c., how many hats can be bought for 3825c.?

EXERCISE LXVII.

1. A man bought wheat at 47 cents a bushel and sold it at 56 cents a bushel. He gained 327645c. How many bushels did he buy?

2. A merchant bought 13 bales of cloth of 27 pieces each, and each piece contained 34 yards. What is it worth at 17 cents a yard?

3. A moulder has 17385 pounds of metal. Find the least number of pounds he must buy in order to mould cannon balls weighing 68 pounds each and use all the metal.

4. A jeweller sold 15 clocks and 22 watches. For the clocks he got $12 each, and for a watch 7 times as much as for a clock. How much did he get for all?

5. A man bought 163 barrels flour at $9 a barrel; 15 barrels were spoiled, and the rest sold at $11 a barrel. Did he gain or lose, and how much?

6. If 4 bushels of wheat of 60 pounds each will make 1 barrel of flour, how many pounds of wheat will be required for 160 barrels of flour?

7. I borrowed from A 9386c.; from B, 4631c.; from C, 10188c., and from D, 908c. I paid E a debt of 19758c. How much had I left?

8. I bought 324 pounds of tea for 24300c. If I sold it at an advance of 15 cents a pound, what was my whole gain and my selling price per pound?

9. How much tea at 46 cents a pound must be given in exchange for 18 gallons of maple syrup at 92 cents a gallon?

10. What number multiplied by 79 will give the same product as 279 multiplied by 553?

EXERCISE LXVIII.

1. In a division question the divisor is 8 times and the quotient is 7 times the remainder. What is the dividend, the remainder being 168?

2. If two steamers leave Quebec for Liverpool at the same time, one going 18 miles and the other 14 miles an hour, how far will the first be ahead of the second in 37 hours?

3. By selling 31 horses for $3100 I lose $155. For what should I sell 16 horses to gain $597?

4. If 59 articles cost 4307c., for how much must 23 of them be sold to gain 183c. on those sold?

5. A drover bought 84 horses for $11424. He sold them at $168 each. Find his gain.

6. Two equal sums were divided, the one among 9 men, the other among a number of boys. Each man received 300c. and each boy 18c. How many boys were there?

7. The salary of the President of the United States is $50000 a year. What sum may he expend each year, and yet save $75584 in 4 years, his term of office?

8. A man bought a farm for $3612. He sold half of it at $56 an acre for $2408. How many acres did he buy and what did he give per acre?

9. Two men had an equal interest in a herd of cattle. One took 72 at $35 apiece and the other took the rest at $42 apiece. How many cattle were there in the herd?

10. A man travels due north for 7 days at the rate of 37 miles a day. He then returns on his path at the rate of 29 miles a day. How far is he from the starting-point at the end of 12 days' travel?

CHAPTER III.

COMPOUND NUMBERS.

I. TABLES, DEFINITIONS, AND REDUCTION.

A Simple quantity is one expressed in terms of a single unit, as 4 yards, 5 miles, 16 ounces.

A Compound quantity is one expressed in terms of more than one unit, as 4 yards 2 feet.

Reduction is the process of changing the unit or denomination of a simple or compound quantity without changing the value of the quantity.

Reduction Descending is the process of changing a quantity from units of a higher denomination to those of a lower denomination.

Reduction Ascending is the process of changing a quantity from units of a lower denomination to those of a higher denomination.

Canadian Money.

100 cents (ct.)=1 dollar, or $1.

Ten *Mills* make one cent. The mill is not coined.

EXERCISE LXIX.

Reduce the following to cents:—

1. 7 dollars 25 cents; 4 dollars 8 cents; 5 dollars and 5 cents.
2. 30 dollars 4 cents; 100 dollars 90 cents; 3000 dollars.
3. $7.06; $10.45; $80.07; $100.90; $27.05; $404.04.
4. $100.01; $1000; $101.81; $1000.01; $70007.70.
5. $371.75; $575.49; $6184.72; $378.84; $967.09.

Reduce the following to dollars or to dollars and cents:—

6. 700 cents. 3684 cents. 44968 cents.
7. 1001 cents. 57648 cents. 10000 cents.
8. 27010 cents. 47006 cents. 7400007 cents.
9. 97000 cents. 2000007 cents. 4710071 cents.
10. 470841 cents. 1010101 cents. 20600609 cents.

Sterling, or English Money.

4 farthings (far.) = 1 penny, or 1d.
12 pence = 1 shilling, or 1s.
20 shillings = 1 pound, or £1.
21 shillings = 1 guinea.

A farthing is written ¼d.; two farthings, ½d.

EXERCISE LXX.

Reduce to farthings:—

1. 8d.; 124d.; 375d.; 451d.; 784d.; 1960d.; 7000d.

Reduce to pence:—

2. 5s.; 71s.; 100s.; 241s.; 369s.; 297s.; 9009s.

Reduce to shillings:—

3. £7; £17; £90; £419; £48 17s.; £100 12s.

Reduce to farthings:—

4. 5s. 6d.; 8s. 4d.; 10s. 6d.; 12s. 3 far.; 19s. 9d.; £10.
5. £6 10s.; £4 18s.; £7 8d.; £5 13s. 10d.; £50 19s. 5¼d.

Reduce to pence:—

6. 36 far.; 720 far.; 425 far.; 900 far.; 1000 far.; 2760 far.

Reduce to shillings:—

7. 80d.; 168d.; 375d.; 1805d.; 17689d.; 5000d.

Reduce to pounds:—

8. 80s. 764s. 1879s. 4567s.
9. 768d. 3689d. 7416d. 87651d.
10. 3684 far. 7689 far. 45672 far. 78947 far.

Avoirdupois Weight.

16 ounces (oz.) = 1 pound, or 1 lb.
100 pounds = 1 cental, or hundredweight, or 1 cwt.
20 hundredweight = 1 ton, or 1 t.
7000 grains (gr.) = 1 pound avoirdupois.
437½ grains = 1 oz. avoirdupois.
14 lb. = 1 stone.

Avoirdupois weight is used for weighing all articles, except the precious metals, jewels, and medicines when dispensed.

In Great Britain 2240 lb. make a ton, called the long ton.

Troy Weight.

24 grains (gr.) =1 pennyweight, or 1 dwt.
20 pennyweights=1 ounce, or 1 oz. Troy.
12 ounces =1 pound, or 1 lb. Troy.
480 grains =1 oz. Troy.
5760 grains =1 pound Troy.

Troy weight is used for weighing the precious metals, gold, silver, and platinum.

Apothecaries' Weight.

20 grains (gr.)=1 scruple, or 1 ℈.
3 scruples =1 dram, or 1 ʒ.
8 drams =1 ounce, or 1 ℥.
12 ounces =1 pound, or 1 ℔.

Apothecaries' weight is used in compounding medical prescriptions.

Long, or Linear Measure.

12 inches (in.)=1 foot, or 1 ft.
3 feet =1 yard, or 1 yd.
5½ yards =1 rod, or 1 rd.
320 rods =1 mile, or 1 mi.

1 mi.=320 rd.=1760 yd.=5280 ft.=80 chains.
A hand, used in measuring horses,=4 in.
A knot, used in navigation,=6086 ft.
A fathom, used in measuring depth at sea,=6 ft.
Gunter's Chain, used in measuring land,=100 links.
1 chain=4 rd.=22 yd.=66 ft.=792 in.

Square, or Surface Measure.

144 square inches (sq. in.)=1 square foot, or 1 sq. ft.
9 square feet =1 square yard, or 1 sq. yd.
30¼ square yards =1 square rod, or 1 sq. rd.
160 square rods =1 acre, or 1 A.
640 acres =1 square mile, or 1 sq. mi.
10000 square links (sq. l.) =1 square chain, or 1 sq. ch.
10 square chains =1 acre.
=4840 sq. yd.
160 acres =1 quarter-section.

Cubic, or Volume Measure.

1728 cubic inches (cu. in.) = 1 cubic foot, or 1 cu. ft.
27 cubic feet = 1 cubic yard, or 1 cu. yd.
128 cubic feet = 1 cord, or 1 cd.

Firewood and rough stone are measured by the **cord.**

A cord is equal to a pile 8 ft. long, 4 ft. wide, and 4 ft. high.

Dry Measure.

2 pints (pt.) = 1 quart, or 1 qt.
4 quarts = 1 gallon, or 1 gal.
2 gallons = 1 peck, or 1 pk.
4 pecks = 1 bushel, or 1 bu.

In Great Britain grain is sold by the quarter (8 bushels).

Certain articles are sold not by bulk, but by weight. The following table gives the weight of a bushel of a number of these:—

Dried Apples, 22 lb.
Oats, 34 lb.
Barley, 48 lb.
Buckwheat, 48 lb.
Timothy Seed, 48 lb.
Flax Seed, 50 lb.
Indian Corn, 56 lb.
Rye, 56 lb.
Fine Salt, 56 lb.
Beans, 60 lb.
Peas, 60 lb.
Clover Seed, 60 lb.
Wheat, 60 lb.
Potatoes, 60 lb.
Turnips, 60 lb.
Onions, 60 lb.

Liquid Measure.

2 pints (pt.) = 1 quart, or 1 qt.
4 quarts = 1 gallon, or 1 gal.

The Imperial gallon contains 277·274 cu. in.

A cubic foot of water weighs 1000 oz. or 62½ lb. and contains 6¼ gal. Thus a gallon of water weighs 10 lb.

Time Measure.

60 seconds (sec.) = 1 minute, or 1 min.
60 minutes = 1 hour, or 1 hr.
24 hours = 1 day, or 1 da.
7 days = 1 week, or 1 wk.
365 days = 1 common year, or 1 yr.
366 days = 1 leap year.

Thirty days have September,
April, June and November.

The other months, except February, have 31 days each. February has 28 days, except in leap year, when it has 29.

The leap years are those whose numbers can be divided exactly by 4, except in the case of the even hundreds. These must be exactly divisible by 400. Thus 1892, 1896 and 1600 were leap years; 1894, 1897 and 1900 were not leap years.

Each day is considered to commence at midnight.

Circular, or Angular Measure.

60 seconds (″) = 1 minute, or 1′.
60 minutes = 1 degree, or 1°.
360 degrees = 1 circumference, or 1 C.

A degree of the circumference of the earth at the Equator contains 60 geographical miles, or 69·16 statute miles.

Miscellaneous Units.

12 units = 1 dozen, or 1 doz.
12 dozen = 1 gross, or 1 gro.
12 gross = 1 great gross.
20 units = 1 score, or 1 sc.

24 sheets = 1 quire, or 1 qr.
20 quires = 1 ream, or 1 rm.
196 lb. = 1 barrel of flour.
200 lb. = 1 barrel of pork.

EXERCISE LXXI.

Reduce to ounces Avoirdupois:—

1. 2 lb. 5 lb. 29 lb. 128 lb.
2. 2 t. 3 t. 50 lb. 7 t. 1200 lb. 7 t. 15 oz.

Reduce to pounds Avoirdupois:—

3. 36 oz. 480 oz. 585 oz. 7162 oz.

Reduce to tons:—

4. 4216 lb. 82161 lb. 367184 oz. 789641 oz.

Reduce to inches:—

5. 7 ft. 9 ft. 8 in. 29 ft. 3 in. 145 ft. 6 in.

Reduce to yards:—

6. 27 ft. 464 in. 3765 in. 17854 in.

Reduce to square inches:—

7. 8 sq. ft. 17 sq. ft. 100 sq. in. 5 sq. yd. 2 sq. ft.

Reduce to square yards:—

8. 78 sq. ft. 876 sq. ft. 3689 sq. in. 176415 sq. in.

Reduce to cubic inches:—

9. 3 cu. ft. 5 cu. ft. 9 cu. ft. 121 cu. ft. 100 cu. in.

Reduce to cords:—

10. 1768 cu. ft. 5768 cu. ft. 9764 cu. ft. 96541 cu. ft

EXERCISE LXXII.

Reduce to pints:—

1. 4 qt. 7 qt. 96 qt. 1 pt. 471 qt. 1 pt.

Reduce to gallons:—

2. 27 qt. 761 qt. 568 pt. 9765 pt.

Reduce to bushels:—

3. 4768 lb. wheat. 57896 lb. oats. 76891 lb. rye.

Reduce to pints:—

4. 3 gal. 5 gal. 1 qt. 7 gal. 3 qt. 9 gal. 1 qt. 1 pt.

Reduce to gallons:—

5. 17 pt. 245 pt. 7689 pt. 2010 pt.

Reduce to seconds:—

6. 7 min. 5 sec. 17 hr. 15 min. 5 da. 1 hr. 7 min.

Reduce to days:—

7. 120 hr. 71856 min. 33333 min. 796841 sec.

Reduce to seconds:—

8. 24′ 768′ 17″ 34° 15′ 19″ 171° 51″

Reduce to degrees:—

9. 700′ 956′ 7689″ 76451″

Select the leap years out of the following:—

10. 1760 1815 1800 1837 1856 1890

EXERCISE LXXIII.

Add the following:—

1.	£	s.	d.	£	s.	d.	£	s.	d.
	24	12	6	25	16	8	123	14	6
	25	13	9	17	13	9	137	18	10
	17	18	10	14	17	11	246	19	11
	15	7	8	16	10	7	301	8	9

2.	cwt.	lb.	oz.	t.	cwt.	lb.	t.	cwt.	lb.	oz.
	17	16	14	40	16	16	7	17	15	15
	18	21	10	16	18	94	18	14	47	12
	18	16	7	47	15	87	19	8	76	10
	21	9	4	21	9	75	9	20	87	14

3.	yd.	ft.	in.	yd.	ft.	in.	yd.	ft.	in.
	15	1	7	3	2	10	17	2	11
	23	2	9	4	2	5	14	1	9
	35	0	6	5	0	6	12	1	7
	7	2	11	4	2	7	13	0	6

4.

bu.	pk.	qt.
5	1	3
6	1	1
2	0	0
3	0	2

bu.	pk.	qt.	pt.
6	3	5	1
8	1	6	1
9	2	5	0
7	3	4	1

gal.	qt.	pt.
36	2	1
42	1	1
25	3	0
28	3	1

5.

gal.	qt.	pt.
13	2	1
2	3	0
15	0	0
7	1	1

da.	hr.	min.	sec.
15	18	50	49
1	13	59	59
4	23	0	4
10	11	1	4

wk.	da.	hr.	min.	sec.
1	2	13	40	30
2	6	10	8	3
	5	22	55	45
2	3	4	1	15

Subtract the following:—

6.

£	s.	d.
7	9	6
4	5	9

£	s.	d.
50	0	1
30	10	10

cwt.	lb.	oz.
20	45	7
16	22	13

7.

t.	cwt.	lb.
27	14	56
16	18	94

yd.	ft.	in.
14	1	4
10	2	11

yd.	ft.	in.
54	0	0
6	1	9

8.

bu.	pk.	qt.
56	1	0
27	3	1

bu.	pk.	qt.
27	1	1
18	1	3

gal.	qt.	pt.
4	1	0
3	2	1

9.

da.	hr.	min.	sec.
5	16	21	18
2	22	12	37

wk.	da.	hr.	min.	sec.
3	4	23	45	30
1	6	16	30	45

°	′	″
25	36	15
18	45	36

10.

°	′	″
48	51	17
17	57	28

c. yd.	c. ft.	c. in.
48	16	1000
16	24	1245

c. yd.	c. ft.	c. in.
100	0	760
48	24	1000

EXERCISE LXXIV.

Multiply the following:—

1.

£	s.	d.
13	5	10
		5

£	s.	d.
75	15	8
		6

cwt.	lb.	oz.
15	18	9
		9

2.

t.	cwt.	lb.	oz.
7	14	16	7
			8

yd.	ft.	in.
17	1	11
		12

yd.	ft.	in.
87	2	9
		11

3.

bu.	pk.	qt.	pt.
4	2	3	1
			5

bu.	pk.	qt.	pt.
7	3	7	1
			12

gal.	qt.	pt.
4	3	1
		7

4.

gal.	qt.	pt.
15	2	1
		12

da.	hr.	min.
17	17	17
		9

da.	hr.	min.	sec.
5	19	41	52
			8

5.	17° 41′ 57″ 7	84° 27′ 28″ 5	c. yd. c. ft. c. in. 7 24 245 11

Divide the following:—

6.	£ s. d. 4)81 17 8	£ s. d. 7)36 7 5	cwt. lb. oz. 6)47 15 4
7.	t. cwt. lb. oz. 8)20 5 16 8	yd. ft. in. 6)75 2 6	yd. ft. in. 9)83 2 3
8.	bu. pk. qt. pt. 7)34 2 5 1	bu. pk. gal. qt. 9)73 1 1 1	gal. qt. pt. 5)78 0 1
9.	gal. qt. pt. 7)30 2 1	hr. min. sec. 9)1479 57 36	da. hr. min. sec. 3)563 17 47 51
10.	4)77° 2′ 48″	7)876° 5′ 48″	c. yd. c. ft. c. in. 9)178 14 81

EXERCISE LXXV.

Divide the following:—

1. £30 6s. 8d. by £2 6s. 8d.; £8 18s. by 5s. 6¾d.

2. 3 t. 16 cwt. by 19 lb.; 1 t. 16 cwt. 83 lb. 12 oz. by 105 lb. 4 oz.

3. 44 yd. 2 ft. 9 in. by 33 in.; 7 yd. by 6 in.

4. 78 A. 71 sq. rd. by 1 A. 3 sq. rd.; 100 sq. yd. by 1 sq. ft. 36 sq. in.

5. 327 cu. ft. 1094 cu. in. by 1 cu. ft. 14 cu. in.; 74 cords by 148 cu. ft.

6. 87 bu. by 1 qt. 1 pt.; 29 bu. 1 pk. 1 qt. 1 pt. by 5 pt.

7. 33 gal. 3 qt. by 1 qt. 1 pt.; 30 gal. 2 qt. 1 pt. by 7 pt.

8. 12 hr. 48 min. by 16 sec.; 8 da. 3 hr. by 1 hr. 15 min.

9. 2° 42′ 30″ by 2′ 5″; 7 C. by 1° 30′.

10. 35 rm. by 15 sheets; 75 rm. 15 qr. by 5 qr.

EXERCISE LXXVI.

1. What is the height of a horse that stands 14 hands high?

2. How many pints of molasses are there in a hogshead containing 63 gallons?

3. Find the number of hours in January.

4. How many parcels, each weighing 15 lb. 4 oz., can be made from 1 ton, and what weight will be remaining?

5. If an ounce of pure gold is worth £3 17s. 10½d., find the value of a bar of pure gold weighing 2 lb. 6 oz.

6. What is the value of 82 marks, when a mark is worth 13s. 4d.?

7. A rectangular box is 4 ft. 4 in. long, 1 ft. 10 in. wide and 17 in. deep, outside measurement. Find the length of a string that will go round it—(1) lengthwise, (2) crosswise.

8. The angles of a triangle contains 180°. One angle is 42° 36′ 45″, another is 29° 42′ 37″. Find the third angle.

9. If the posts in a telegraph line are 45 yards apart, how many are there in 9 miles?

10. If the wool from a sheep each year weighs 7 lb. 8 oz., find the value of the wool from a flock of 360 sheep at $19.60 per cwt.

EXERCISE LXXVII.

1. A merchant bought tobacco at $55 a cwt., and sold it at 4 cents an ounce. How much did he gain on 3 cwt.?

2. How many telegraph poles are there in 16 mi. 80 rd. of line, the poles being 4 rd. apart?

3. Find the cost of a pile of wood containing 3328 c. ft. at $4 per cord.

4. A farm is 50 chains long and 20 chains wide. How many yards long are the boundary fences?

5. Find the value of 17 sq. miles 85 ac. of land at $15 per acre.

6. Find the number of minutes from 17 minutes to ten in the forenoon till 25 minutes past three in the afternoon.

7. A grocer bought a cheese weighing 45 lb. 6 oz. He sold 2 lb. 4 oz. to one woman, 1 lb. 8 oz. to a second, and 3 lb. 12 oz. to a third. How much of the cheese remains unsold?

8. A cubic foot of water weighs 62 lb. 8 oz. How many tons of water are there in a tank containing 480 c. ft.?

9. A gallon of water weighs 10 lb. How many gallons are there in the tank in question 8?

10. Find the cost of grading a railroad 57 miles long at $5.50 per yard.

EXERCISE LXXVIII.

1. How many tons of provisions are required to feed 480 men for 60 days, if each man receives 3 lb. 2 oz. each day?

2. How many silver spoons, each weighing 2 oz. 8 dwt., can be made from a bar of silver weighing 12 lbs.?

3. How often can 2 ft. 3 in. be subtracted from 81 yards?

4. If Mary takes 2 min. 20 sec. to read a page of a book, how many such pages can she read in 35 minutes?

5. If a bicycle rider goes 2 miles 35 rods every 6 min., how far will he go in 2 hours?

6. A merchant bought 780 yards of cloth at 9s. 3d. a yard, and retailed it at 12s. 1d. a yard. Find his total gain.

7. If it costs 12s. 6d. more to build a fence 35 yards long than one 30 yards long, find the cost of building 75 yards of such fence.

8. A man bought 3672 lb. of oats at 27 cents a bushel and 3136 lb. of rye at 46 cents a bushel. How much had he to pay?

9. Seventy-five bushels of wheat at 68 cents a bushel will buy how many yards of cloth at 85 cents per yard?

10. A merchant bought 79 reams of foolscap, for which he paid $237. How much did he pay for a quire?

EXERCISE LXXIX.

1. A merchant sold to one man 19 gal. 3 qt. 1 pt. of molasses; to another he sold 27 gal. 2 qt. 1 pt., and had 48 gal. 1 pt. left. How much had he at first?

2. Out of a cask having 27 gal. 1 pt. of vinegar, 14 gal. 2 qt. were sold. How much remained in the cask?

3. A farmer sold six loads of wheat which grew on one field, as follows:—The first weighed 47 bu. 36 lb., the second 48 bu. 15 lb., the third 47 bu. 35 lb., the fourth 47 bu. 55 lb., the fifth 48 bu. 19 lb., and the sixth 38 bu. 56 lb. How much wheat grew on this field?

4. There are 12 acres in the field referred to in the last example. Find the yield per acre.

5. A clock which gains 45 seconds every 8 hours is set right at noon on Monday. When it is 8 o'clock in the evening of Wednesday what time will the clock show?

6. Find the weight of two dozen sterling silver spoons, each one weighing 2 oz. 4 dwt.

7. If 2 lb. of gold are coined into 89 guineas, find the value of pure gold per ounce.

8. 7000 grains make a pound Avoirdupois, and 5760 grains a pound Troy. How many pounds Avoirdupois are of the same weight as 350 lb. Troy?

9. Find the cost of feeding 120 horses for 20 weeks when hay is $8 a ton and oats 30 cents a bushel, if a horse eats 20 lb. of hay and 10 quarts of oats a day?

10. A wagon with 128 packages weighs 2 t. 60 lb. If the wagon weighs 1 t. 140 lb., find the average weight of a package.

CHAPTER IV.

SIMPLE APPLICATIONS OF THE PREVIOUS RULES.

I. BILLS AND ACCOUNTS.

A Debtor, in business transactions, is a purchaser, or a person who receives money, goods, or services from another.

A Creditor is a seller, or a person who parts with money, goods, or services to another.

A Bill is a detailed statement of goods sold or of services rendered, and of payments, if any, made. It should show the place and time of each transaction, the buyer and seller, the quantity, price and cost of each article, and any payments received.

Form of a receipted Bill.

Toronto, Jan. 12, 1900.

Mrs. F. S. Brown.

Bought of Hill & Weir.

Dec.	26	12 yd. Calico, @ 16 ct.	1	92
"	"	2 Silk Scarfs, @ $1.35	2	70
"	27	30 yd. Linen Crash, @ 21 ct. . . .	6	30
"	28	4 pair Kid Gloves, @ $1.50 . . .	6	00
"	"	1½ doz. spools Cotton, @ 60 ct. . .		90
"	"	1 piece Ticking, 42 yd., @ 37 ct. .	15	54
			$33	36

Received Payment,

Henry F. Waterbury,

for Hill & Weir.

EXERCISE LXXX.

Make out Bills for the following, supplying names of places and dates where necessary:—

1. Mrs. James Brown bought of John Marsh:—6 pair shoes @ $3.25, 8 yd. silk @ $2.40, 3 pair gloves @ $1.25 and 9 collars @ 25 ct.

2. Mrs. John Green sold Charles Jenkins:—75 bu. apples @ 85 ct., 5 tons hay @ $10.85, 50 bu. potatoes @ 60 ct. and 50 cabbages @ 10 ct.

3. John Smith sold Peter Brown:—25 horses @ $115, 143 cows @ $27, 24 oxen @ $45 and 175 sheep @ $5.50.

4. James Sparrow bought of Messrs. Jones & Son:—52 lb. butter @ 18 ct., 16 yd. silk @ $1.45, 23 pair boots @ $2.40, 19 lamps @ $2.35 and 28 lb. sugar @ 6 ct.

5. Mrs. R. Philp bought of the R. Simpson Company:—6 bureaus @ $8.75, 3 easy chairs @ $15.25, 12 dining chairs @ $4.60, 15 mattresses @ $4.50, 2 tables @ $18.75 and 4 mirrors @ $9.75.

6. Samuel Purdy sold Mrs. T. Jones:—125 lb. sugar @ 8 ct., 17 bbl. flour @ $7.75, 48 lb. lard at 11 ct., and 48 lb. meat 13 ct.

7. Mrs. T. Rorer bought of Messrs. Jones & Co.:—4 yd. cloth @ $1.25, 12 pair stockings @ 38 ct., 6 pair kid gloves @ $1.15 and 27 yd. ribbon @ 5 ct.

8. Simon Brown sold Mrs. T. Smith:—21 lb. butter @ 22 ct., 12 lb. cheese @ 16 ct., 114 doz. eggs @ 15 ct., 23 qt. milk @ 6 ct., 27 bu. potatoes at 45 ct. and 32 bu. carrots @ 40 ct.

9. Mrs. Blake bought of the T. Eaton Company:—2 lb. candy @ 15 ct., 5 books @ 25 ct., 3 slates @ 12 ct., 2 quires paper @ 10 ct., 1 box pens @ 35 ct., and 1 box slate pencils @ 10 ct.

10. The R. Simpson Co. sold Mrs. P. Scott:—25 lb. sugar @ 7 ct., 32 lb. tea at 45 ct., 84 lb. coffee @ 35 ct., 62 lb. raisins @ 9 ct., 39 lb. currants @ 8 ct. and 47 lb. biscuits @ 10 ct.

EXERCISE LXXXI.

Make out bills for the following, supplying names of places and dates where necessary:—

1. James Smith bought of Edward Jones:—75 cords hardwood @ $4.50, 10 tons coal @ $6.50 and 15 cords pine @ $2.50. He paid cash $150.

2. Peter Douglas sold James Rogers:—10 lb. sugar @ 5 ct., 6 lb. tea @ 35 ct., 8 lb. coffee @ 25 ct., 5 lb. rice at 7 ct., and 9 lb. cheese @ 16 ct. He took in exchange 4 bags potatoes at 90 cts. and the balance in cash. Make out a receipted bill.

3. William Taylor bought from John McMurtry:—10 lb. sugar @ 8 ct., 6 lb. tea @ 45 ct., 1 set dishes @ $10.50, 15 lb. soap @ 15 ct. He paid $5 in cash at one time and $4 at another. Make out the bill.

4. Thexton Bros. bought from Robert Smith:—25 tons hay @ $7.50, 66 bu. rye @ 40 ct., 104 bu. barley @ 63 ct. and 98 bu. wheat @ 72 ct. They give in exchange 5 bbls. flour @ $7.25, and 75 lb. oatmeal @ 3 ct. and the balance in cash. Make out a receipted bill.

5. Smith & Weir bought from Thomas Scott:—1140 lb. wheat @ 84 ct. per bu., 1802 lb. oats @ 45 ct. per bu., 540 bu. peas @ 50 ct. and 1200 lb. barley @ 48 ct. per bu. On Oct. 17, 1899, he received $100 in cash and the balance on Oct. 28. Make out a receipted bill.

6. Mrs. Brady bought from Smith & Jones:—7 doz. eggs @ 18 ct., 19 lb. soap @ 11 ct., 10 lb. butter at 22 ct., 13 lb. cheese @ 17 ct. and 20 lb. rice @ 4 ct. She gave in exchange 5 geese weighing 54 lb. @ 6 ct. and the balance in cash. Make out a receipted bill.

7. Mrs. R. Porter bought from Jones & Co., Belleville:—27 yd. flannel @ 80 ct., 32 yd. calico @ 9 ct., 6 pair gloves at 90 ct. and 16 yd. muslin @ 12 ct. She paid $10 cash. Make out her bill.

8. John Smith bought of Hill & Groves, London:—16 yd. silk @ $1.15, 72 yd. ticking @ 14 ct., 42 yd. shirting @ 15 ct., 12 yd. flannel @ 40 ct. and 24 yd. print @ 13 ct. He paid cash. Make out a receipted bill.

9. Thomas Taylor bought of Lewis & Sons, May 5:—5 doz. coat hooks @ 35 ct., 7 door knobs @ 20 ct., 25 lb. nails @ 4 ct., June 1st, 5 door locks @ 75 ct., 12 doz. screws at 7 ct., 3 sets fire-irons @ $3.15. Thomas Taylor sold Lewis & Sons, June 10, 1 pair boots @ $3.50, 1 pair rubbers @ 75 ct. The balance was paid June 20. Make out a receipted bill.

10. Henry Philps sold to Aaron Brown:—75 yd. Brussels carpet @ 96 ct., 1 piece cotton, 31 yd., @ 11 ct., 1 box hooks and eyes @ $1.75, 1 piano cover @ $5.50, 1 table cover @ $3.25. Brown worked 10 days @ $1.40 per day for Philps and paid the balance in cash. Make out a receipted bill.

11. June 14, 1899, Samuel Farwell bought the following items of H. J. Thompson & Co.: 9 lb. of paint at 12 ct. a pound; 10 rolls of paper at 20 ct. a roll; 28 rolls at 8 ct. a roll; 44 rolls at 10 ct. a roll; 4 rolls at 25 ct. a roll; 34 yards of border at 6 ct. a yard; 58 yards at 2 ct. a yard; 66 yards at 1 ct. a yard. July 7, 1899, Mr. Farwell returned 3 rolls of paper at 8 ct. a roll, 5 rolls at 10 ct. a roll, and 5 yards of border at 6 ct. a yard. Make out Mr. Farwell's account.

II. SIMPLE MEASUREMENTS.

A Rectangle is a flat surface bounded by four straight lines and having its four angles equal to one another.

A Square is a rectangle contained by equal sides.

A Rectangular Solid is a space enclosed by six rectangular surfaces.

EXERCISE LXXXII.

Draw the following rectangles and find their perimeter:—

1. 2 in. by 3 in., 4 in. by 3 in., 5 in. by 6 in., 4 in. by 4 in.

2. The ceiling of a rectangular room is 16 ft. by 12 ft. Find its perimeter.

3. A rectangular lot is 50 yd. long and 40 yd. wide. Find the cost of fencing it at 25 ct. per yard.

4. How many boards 12 ft. long are there in a fence round a rectangular lot 60 yd. long and 40 yd. wide, the fence being 5 boards high.

5. The posts in a fence round a rectangular lot 60 ft. by 144 ft. are 6 ft. apart. Find the cost of digging the post holes at 5 ct. each.

6. How much will it cost to fence a farm 200 rods long and 80 rods wide at $1.25 per rod?

7. How much will it cost to fence both sides of a road for 1 mile with wire which weighs 1 lb. per rod and costs 8 ct. per lb., the fence being 5 wires high?

8. A square cattle ranch is 2 miles long, how many yards of fencing will enclose it?

9. How much will it cost to enclose a mile square with wire-fencing at $4.50 per chain?

10. A rectangular room is three times as long as it is wide. Its perimeter is 320 feet. Find its length and width.

EXERCISE LXXXIII.

1. Find the area of each of the following rectangles:—

34 ft. by 36 ft.	32 ft. by 38 ft.	72 yd. by 78 yd.

2. Find the number of acres in each of the following rectangular fields:—

36 rd. by 40 rd.	25 rd. by 64 rd.	75 rd. by 32 rd.
70 rd. by 96 rd.	48 rd. by 50 rd.	38 rd. by 80 rd.

3. How many square feet are there in a board 18 ft. long and 12 in. wide?

4. How many square yards are there in a rectangular floor 33 ft. by 21 ft.?

5. A square garden is 48 yd. long. How many square yards does it contain?

6. A close board fence 6 ft. high and 100 yd. long is to be painted. How many square yards are there in the fence?

7. How many square inches are there in the surface of a brick 8 in. long, 4 in. wide, and 2 in. deep?

8. How many square feet are there in the walls of a rectangular room 12 ft. high, 28 ft. long and 16 ft. wide?

9. A rectangular plot 60 ft. by 130 ft. has a path round the outside 5 ft. wide. Find the number of square feet in the path.

10. How many square feet are there in a board 18 ft. long and 13 in. wide at one end, 19 in. wide at the other.

EXERCISE LXXXIV.

1. A rectangular floor contains 486 sq. ft. It is 27 ft. long; find its width.

2. A rectangular surface contains 648 sq. yd. If it is 108 ft. long, find its width.

3. A rectangular field containing 16 acres is 64 rods long. How wide is it?

4. A rectangular field containing 18 acres is 80 rods long. Find the cost of fencing it at $1.25 per rod.

5. A rectangular lot contains 1600 sq. yd. Its length being 240 ft., find the cost of fencing it at 25 ct. per foot.

6. How many boards 12 ft. long would be required to enclose a rectangular lot containing 9600 sq. yd. with a straight fence 5 boards high, the lot being 240 ft. wide.

7. The walls of a room contain 96 sq. yd. The room is 12 ft. high. Find its perimeter.

8. A bought a farm containing 220 acres. If it is 176 rods wide, what will it cost to fence it in at $1.25 per rod?

9. To paint a close board fence 6 ft. high at 15 ct. per sq. yd. costs $36. Find the length of the fence.

10. At $25 an acre a farm costs $2000. This farm is 200 rd. long. Find the cost of fencing it at $1.25 per rod.

CARPETING.

In computing how much carpet is needed for a room there are two modes of procedure—(1) the *mathematical*, where the quantity equal to the floor space is found, and (2) the *practical* or *arbitrary*, where the number of strips of carpet required is first found, and, an allowance being made for matching the pattern as well as turning under at the side when necessary, the quantity required is then computed.

EXERCISE LXXXV.

1. Find what length of carpet 36 in. wide is required for a rectangular room 24 ft. by 15 ft.

2. A rectangular floor 36 ft. by 25 ft. is to be covered with oilcloth 60 in. wide. How many yards will be required?

3. How many yards of carpet 27 in. wide will cover a rectangular room 18 ft. by 12 ft.

4. A rectangular room is 27 ft. by 17 ft. 6 in. How many yards of carpet 27 in. wide will cover it?

5. There is a square room 42 ft. long to be covered with carpet 1 yard wide. How many yards are required?

6. Find the cost of carpeting a rectangular room 24 ft. by 18 ft. with carpet 27 in. wide at 90 ct. per yard.

7. A rectangular room 15 ft. by 12 ft. is covered with carpet 36 in. wide which costs 65 ct. per yard. Find the cost.

8. Find the cost of carpeting a rectangular room 36 ft. by 26 ft. with carpet a yard wide at $1.25 per yard.

9. Find the cost of carpeting a rectangular room 12 ft. by 18 ft. with carpet 27 in. wide at 75 ct. a yard.

10. Find the cost of carpeting a stairway of 24 steps, each step being 11 in. wide and rising 7 in., with carpet at $1.05 per yard.

EXERCISE LXXXVI.

1. How many strips of carpet 36 in. wide are required to cover a rectangular room 27 ft. by 18 ft.—(1) if the strips run lengthwise, (2) if they run crosswise?

2. How many strips of carpet 27 in. wide are needed to cover a rectangular room 18 ft. wide, if the strips run lengthwise?

3. How many strips of carpeting 30 in. wide are needed for a square room 40 ft. long?

4. How many strips of oilcloth 60 in. wide are required to cover a room 40 ft. wide, the strips running lengthwise of the room?

5. A rectangular room, 22 ft. 6 in. wide, is covered with carpet 27 in. wide. How many strips are there?

6. How many yards of carpet 30 in. wide will be required for a rectangular room 27 ft. by 20 ft., the strips running lengthwise of the room?

7. How many yards of carpet 36 in. wide are needed for a rectangular room 24 ft. by 18 ft., the strips running lengthwise of the room?

8. Find the cost of carpeting a rectangular room 24 ft. by 21 ft., with carpet a yard wide at $1.05 per yard, the strips running lengthwise of the room.

9. Find the cost of carpeting a rectangular room 27 ft. by 20 ft., with carpet 27 in. wide at $1.10 per yard, the strips running crosswise of the room.

10. Find the cost of carpeting a rectangular room 30 ft. by 22 ft., with carpet 30 in. wide at $1.25 per yard, the strips running crosswise of the room.

PLASTERING.

In reckoning the area to be plastered in a room, there are two methods of procedure—(1) the *mathematical*, where the exact number of square yards is found by finding the total area within the boundary line of the work, and from this deducting the area of all the openings; and (2) the *arbitrary* or *practical* method. In this case the total area within the boundary lines of the work is found. From this area, half the area of the doors and windows is subtracted. The nearest whole number of square yards in the remainder is the area for which the plasterer is to be paid.

EXERCISE LXXXVII.

1. How many square yards of plastering are there in the ceiling of a rectangular room 30 ft. by 24 ft.?

2. How many square yards of plastering are there in the walls of a rectangular space 38 ft. long, 25 ft. wide and 12 ft. high?

3. How many square yards of plastering are there in the walls and ceiling of a rectangular room 30 ft. by 24 ft. and 12 ft. high?

4. Find the cost of plastering the ceiling of a rectangular room 24 ft. by 18 ft. at 19 ct. per square yard.

5. Find the cost of plastering a surface equal to the walls and ceiling of a rectangular room 27 ft. by 18 ft. and 12 ft. high at 23 ct. per square yard.

6. A rectangular room 27 ft. by 18 ft. and 10 ft. high has 3 doors, each 7 ft. by 4 ft.; 3 windows, each 6 ft. by 3 ft., and 1 window 6 ft. by 4 ft. Find the area to be plastered on the walls only—(1) mathematically, (2) practically.

7. Find the cost of plastering the walls only of a rectangular room 30 ft. by 24 ft. and 12 ft. high, there being 3 doors, each 8 ft. by 5 ft.; 3 windows, each 7 ft. by 4 ft., and 1 window 6 ft. by 5 ft., at 20 ct. per sq. yd.—(1) mathematically, (2) practically.

8. At 25 ct. per sq. yd., find the cost of plastering the walls of a rectangular room 25 ft. by 20 ft. and 10 ft. high, there being 2 doors 7 ft. by 5 ft., 3 windows 6 ft. by 3 ft., and 1 window 5 ft. by 4 ft.—(1) mathematically, (2) practically.

9. At 25 ct. per sq. yd., find the cost of plastering the walls and ceiling of a rectangular room 24 ft. by 21 ft. and 12 ft. high, there being 3 doors 8 ft. by 4 ft. and 3 windows 7 ft. by 4 ft.—(1) mathematically, (2) practically.

10. At 27 ct. per sq. yd., find the cost of plastering the ceiling and walls of a hall 36 ft. by 27 ft. and 14 ft. high, there being 2 doors 9 ft. by 8 ft. and 9 windows 7 ft. by 4 ft.—(1) mathematically, (2) practically.

WALL PAPER.

In Canada and in the United States, wall paper is usually made into rolls 8 yd. long or double rolls 16 yd. long and 18 in. wide. In Great Britain the usual width is 21 in.

EXERCISE LXXXVIII.

1. How many yards of paper 18 in. wide will paper the ceiling of the room in example 1, last exercise?

2. How many yards of paper 21 in. wide are required to paper the walls of the room in example 2, last exercise?

3. How many yards of paper 18 in. wide will paper the walls and ceiling of the room in example 3, last exercise?

4. How many yards of paper 18 in. wide will paper the ceiling of the room in example 4, last exercise?

5. How many yards of paper 18 in. wide will paper the walls and ceiling of the room in example 5, last exercise?

6. How many yards of paper 36 in. wide will paper the walls of the room in example 6, last exercise?

7. The room in example 7, last exercise, is papered with paper 18 in. wide. How much is required for the walls and ceiling?

8. The walls of the room in example 8, last exercise, are papered with paper 21 in. wide. How much is needed?

9. Find the cost of covering the plaster of the room in example 9, last exercise, with paper 18 in. wide at 15 ct. per roll of 8 yards.

10. Find the cost of papering the walls and ceiling of the hall in example 10, last exercise, with paper 18 in. wide at 25 ct. per roll of 8 yards.

BOARD MEASURE.

Boards one inch or less in thickness are sold by the square foot.

Thus, a board 18 ft. long, 1 ft. wide and 1 in. or less thick contains 18 ft., board measure.

Boards more than an inch thick are sold by the number of feet, board measure, to which they are equivalent.

Thus, a plank 18 ft. long, 1 ft. wide and 3 in. thick contains 54 ft., board measure.

EXERCISE LXXXIX.

1. Find the number of board feet in the following:-

(*a*) A board 12 ft. long, 9 in. wide and 1 in. thick.
(*b*) A board 18 ft. long, 16 in. wide and 1 in. thick.
(*c*) A board 16 ft. long, 18 in. wide and 1 in. thick.
(*d*) A board 16 ft. long, 9 in. wide and 2 in. thick.
(*e*) A board 16 ft. long, 10 in. wide and 3 in. thick.
(*f*) A board 18 ft. long, 16 in. wide and ½ in. thick.
(*g*) A board 16 ft. long, 9 in. wide and ¼ in. thick.

2. How many feet of lumber are there in a close board fence 5 ft. high, 660 ft. long, the boards being 1 in. thick?

3. How many feet of lumber are there in 100 pieces 14 ft. long, 6 in. wide and 6 in. thick?

4. How much lumber is required to put a 12 in. board around a rectangular field 220 yd. by 150 yd.?

5. How many ft. of lumber are there in a sidewalk 160 yd. long, 8 ft. wide, the planks being 2 in. thick?

6. How many feet, board measure, are there in 8 planks, 4 in. thick, 18 ft. long and 16 in. wide?

7. How much lumber is there in 220 yards of fencing, consisting of 5 six-inch boards?

8. A pile of lumber consists of 250 boards, each 16 ft. long, 10 in. wide and 3 in. thick. How many board feet are there?

9. Find the cost of 500 planks, 10 ft. long, 12 in. wide and 3 in. thick, at $20 per thousand, board measure.

10. What is the value of a pile of inch lumber consisting of 2000 boards 15 ft. long and 12 in. wide at $18 per thousand?

RECTANGULAR SOLIDS.

EXERCISE XC.

1. How many c. ft. of air are there in a rectangular room 18 ft. by 16 ft. and 10 ft. high?

2. How many c. ft. of timber are there in a rectangular stick 35 ft. long, 3 ft. wide and 2 ft. deep?

3. How many cubic yards of stone are there in a rectangular pile 15 ft. long, 12 ft. wide and 9 ft. high?

4. How many cubic yards of earth are taken from a cellar 30 ft. long, 21 ft. wide and 9 ft. deep?

5. White pine weighs 24 lb. per cubic foot. What is the weight of a rectangular stick of such timber 28 ft. long, 3 ft. wide and 2 ft. thick?

6. What will the digging of a cellar 18 ft. long, 15 ft. wide and 9 ft. deep cost at 45 ct. per cubic yard?

7. A gravel pit 60 ft. wide and 360 ft. long is excavated to the uniform depth of 17 ft. How many cubic yards of gravel are removed?

8. How many cubic yards of stone and mortar are in the foundation of a barn 60 ft. long and 36 ft. wide, the wall being 2 ft. thick and 8 ft. high?

9. How many cubic feet of masonry are there in the foundation of a house 40 ft. long and 30 ft. wide, the wall being 9 ft. high and 2 ft. thick?

10. Find the cost of 24 rectangular blocks of stone, each 9 ft. by 6 ft. by 5 ft., at $5.75 per cubic yard.

EXERCISE XCI.

1. How many cords of wood are there in a pile 24 ft. long, 16 ft. wide, 10 ft. high?

2. Find the number of cords of wood in a pile 48 ft. long, 14 ft. high and 12 ft. wide.

3. Find the number of cords in a pile of wood 120 ft. long, 4 ft. wide and 8 ft. high.

4. How much should be paid for a pile of 4-foot wood, 128 ft. long and 7 ft. high, at $3 per cord?

5. Find the value of 16 piles of wood, each 24 ft. long, 4 ft. wide, 8 ft. high, at $2.25 per cord.

6. Find the cost of a pile of wood 112 ft. long, 5 ft. wide and 8 ft. high, at $2.15 per cord.

7. There are 60 cords of wood in a pile 8 ft. wide and 12 ft. high. How long is the pile?

8. There are 35 cords of wood in a pile 14 ft. high and 64 ft. long. How wide is the pile?

9. The cost of a pile of wood at $3 per cord is $360. It is 240 ft. long and 8 ft. wide. How high is the pile?

10. At $2.25 per cord a pile of wood is worth $236.25. It is 5 ft. wide and 12 ft. high. How long is the pile?

EXERCISE XCII.

1. There are 70 c. yd. of earth taken from a cellar 18 ft. long and 15 ft. wide. How deep is the cellar?

2. A rectangular room 30 ft. by 25 ft. contains 8250 c. ft. of air. How high is the room?

3. In a pile of wood there are 6 cords. The pile is 4 ft. wide and 8 ft. high. How long is it?

4. A stick of square timber contains 180 c. ft. It is 30 ft. long and 2 ft. wide. How thick is it?

5. A brick wall 2 ft. thick and 40 ft. high contains 8960 c. ft. How long is the wall?

6. A brick contains 64 c. in. How many bricks are there in a rectangular pile 12 ft. long, 8 ft. wide and 7 ft. high?

7. There are 3072 c. ft. of masonry in a stone wall 8 ft. high and 2 ft. thick. How long is the wall?

8. If the wall in example 7 is the stone foundation of a barn 60 ft. long, how wide is the barn?

9. A rectangular box 48 in. long and 30 in. deep, inside measurement, contains 25 c. ft. How wide is the box?

10. A rectangular cutting 360 yd. long and 25 ft. wide has 17000 c. yd. of earth taken out of it. What is the average depth of the cutting?

EXERCISE XCIII.

1. Two-foot wood is piled 6 feet high. How long must the pile be to contain 3 cords?

2. How much will it cost to have a tin roof put on a stable, each slope of which measures 25 ft. by 14 ft. at $5.75 per 100 sq. ft.?

3. From a lot 40 rods square 160 sq. rods were sold. What is the value of the remainder at $120 per acre?

4. A cubic foot of black spruce weighs 28 lb. Find the weight of 10 planks of this wood, each 16 ft. long, 1 ft. wide and 3 in. thick.

5. A ton of hard coal occupies 42 c. ft. How many tons of hard coal will a bin 16 ft. long, 12 ft. wide and 7 ft. deep hold?

6. How many tons of water will a tank 16 ft. long, 12 ft. wide and 8 ft. deep hold? (1 c. ft. weighs 1000 oz.)

7. A street 660 ft. long and 24 ft. wide has to be filled in to the depth of 3 ft. How many cubic yards of earth will be required?

8. Find the cost of laying a tile drain a mile long at 15 ct. per foot.

9. What will it cost to enclose a mile square with wire fencing at $4.50 per chain?

10. What will it cost to shingle a barn, the roof of which is 80 ft. long and the slope on each side 30 ft. at $1.50 per 100 sq. ft.?

EXERCISE XCIV.

1. How much will it cost to paint a close board fence 6 ft. high around a rectangular lot 36 yd. by 32 yd. at 12 ct. per sq. yd.?

2. What length of road 66 ft. wide will contain one acre?

3. How many rectangular sods each 20 in. by 9 in. will be required to sod a rectangular lawn 60 ft. by 75 ft.?

4. What must be the depth of a wagon box 10 ft. long and 4 ft. wide that the contents may be 120 c. ft.?

5. A rectangular box is 6 ft. 8 in. long, 4 ft. 6 in. wide and 3 ft. deep, inside measurement. Find the cubic content of the box.

6. A bicycle wheel is 10 ft. 1 in. around the tire, and turns 17280 times in a journey from A to B. How far is A from B?

7. What length of board 16 in. wide will contain 20 sq. ft.?

8. What length of board 15 in. wide will contain 11 sq. ft. 36 sq. in.?

9. How many square yards of oilcloth will be required to cover a rectangular room 20 ft. 3 in. long and 16 ft. wide?

10. A rectangular box 11 ft. 3 in. long and 5 ft. 4 in. wide contains 300 cu. ft. How deep is the box?

III. SHARING.

EXERCISE XCV.

1. Divide $40 between two boys so that one may have $6 more than the other.

2. James and Thomas have 49 yd. of cloth, and James has 11 yd. more than Thomas. How many has each?

3. Divide 84 marbles between James and Robert, giving Robert 12 more than James.

4. Divide $99 between two boys, giving one $1.50 more than the other.

5. Divide $50000 between A and B, giving B $4000 less than A.

6. A horse and buggy are worth $375, and the horse is worth $55 more than the buggy. Find the value of each.

7. A man earned $796 in two years. In the first year he earned $54 more than the 2nd, find the amount earned each year.

8. Two trains start at the same time from Montreal and Sarnia, a distance of 508 miles. When they meet one has gone 34 miles less than the other. How far has each gone?

9. 756 votes were polled for two candidates. The elected one had a majority of 34. How many votes had each?

10. A house and lot together cost $5750. The house cost $3250 more than the lot. Find the cost of each.

EXERCISE XCVI.

1. A yacht and its fittings cost $6400. The yacht cost $3840 more than the fittings. Find the cost of each.

2. A farmer raised 4375 bu. of wheat in two years. In the second year he had 247 bu. more than in the first. How many bu. had he in each year?

3. A merchant bought $4968 worth of hardware and groceries. The groceries cost $484 less than the hardware. Find the cost of the hardware.

4. The perimeter of a rectangular field is 1206 yd. and the length is 119 yd. greater than the width. Find the length and width of the field.

5. Three times the sum of two numbers is 1836, and one is 18 more than the other. Find the numbers.

6. Four times the sum of two numbers is 3984, and one is 72 less than the other. Find the numbers.

7. Two men together chopped 52 cords of wood. One chopped 3 cords 50 c. ft. more than the other. How much did each chop?

8. Two adjacent fields together contain 20 acres. The larger contains 90 sq. rods more than the other. Find the area of each field.

9. Two men are ten miles apart. They walk straight towards each other, and when they meet one has gone 90 rods less than the other. How far has he walked?

10. Two loads of hay together weigh 3 t. 8 cwt., and one weighs 12 cwt. more than the other. Find the weight of each.

EXERCISE XCVII.

1. Divide 120 marbles between two boys giving one three times as many as the other.

2. Two books together contain 762 pages, and one has twice as many pages as the other. How many pages are in each?

3. Two pieces of cloth together contain 115 yards, and one piece is 4 times as long as the other. How long is each?

4. Two houses are together worth $12250. One is worth 4 times as much as the other. Find the value of each.

5. Two men have together $243. One has $18 more than twice as much as the other. How much has each?

6. Two lots are together worth $607. One is worth $27 more than thrice the other. Find the value of each.

7. Two farms are together worth $13950. One is worth $150 more than three times the other. Find the value of each.

8. Find the length and breadth of a field whose perimeter is 240 rods and the length three times the breadth.

9. A and B together own 120 acres, A having 24 acres more than B. A sells his part at $84 an acre and B sells his for the same amount of money. What does B get per acre?

10. At an election 4977 votes were polled. The successful candidate received 17 votes more than three times as many as his opponent. How many votes did each receive?

EXERCISE XCVIII.

1. Divide $84 between two men, giving the first $3 as often as the second gets $4.

2. A mixture of 210 bu. of oats and peas is made up as follows:—For every 2 bu. oats there are 5 bu. peas. How many bushels are there of each?

3. A roll of bills contains $153. It is made up of an equal number of $5 bills and $4 bills. How many are there of each?

4. Divide $19500 between two men so that when the first gets $2 the second may get $3.

5. Two books together contain 605 pages. For every five pages in the first book there are six pages in the second. How many pages are there in each book?

6. Divide $120 among three men so that when the first gets $1 the second may get $2 and the third $3.

7. Divide 150 marbles among three boys so that when the 1st gets 2 marbles the 2nd may get 3 and the 3rd 5.

8. A sum of money, $2.40 is made up of five ct. pieces, ten ct. pieces and twenty-five ct. pieces and the same number of each. How many are there of each?

9. Divide $1120 among A, B, and C, so that A may have 3 times as much as B, and C may have as much as A and B together.

10. Three houses are together worth $16410. The first is worth twice as much as the other two together and the second is worth $570 more than the third. Find the value of each.

EXERCISE XCIX.

1. A man sold three sheep for $31. For the second he received $2 more than for the first, and for the third $3 more than for the second. How much did he receive for each?

2. Three men weigh 456 lb. The 1st weighs 18 lb. more than the 2nd and the 2nd 18 lb. more than the 3rd. Find the weight of each.

3. Three pieces of cloth contain 444 yd. The 1st has 25 yd. more than the 2nd but 19 yd. less than the 3rd. Find the length of each piece.

4. Three loads of hay weigh 6400 lb. The 1st weighs 200 lb. more than the 2nd and the 2nd 400 lb. more than the 3rd. Find the weight of the 1st.

5. Three pigs weigh 402 lb. The 1st weighs 27 lb. more than the 2nd but 48 lb. less than the 3rd. How much does each weigh?

6. In three days A rode 125 miles upon his bicycle. The 1st day he went as far as on the other two days all but 5 mi. The 2nd day he rode 15 mi. less than the 3rd day. How far did he go each day?

7. The perimeter of a triangular field is 249 rd. The 1st side is 36 rods longer than the 2nd but 42 rd. shorter than the 3rd. How long is each side?

8. In three books there are 1086 pages. The 3rd has 74 more than the 2nd and 196 more than the 1st. How many pages are there in each book?

9. In three years a man saved $1593. In each year he saved $81 more than in the preceding one. How much did he save each year?

10. Three bins contain 573 bu. of wheat. The 1st has 20 bu. more than the 3rd and 53 bu. less than the 2nd. How many bushels are there in each bin?

11. The cost of 5 bu. of oats and 8 bu. of wheat is $6.80 and the cost of a bu. of wheat is 33 ct. more than a bu. of oats. Find the cost of a bu. of oats.

12. A box contained 286 marbles, red, blue, and white. There were 192 red and white, and 199 blue and white. How many of each kind were in the box?

IV. AVERAGES.

The Aggregate of a number of quantities of the same kind is their entire number, or sum.

The Average of a number of quantities of the same kind is the quotient arising from dividing their sum by the number of addends; thus, the average of 4, 8 and 9 is $(4+8+9)\div 3$, or 7.

EXERCISE C.

Find the aggregate of the following:—

1. 47, 275, 368, 495, 784 and 6.

2. 571, 0, 100, 367, 2461, 78, 96 and 10.

3. 6746, 89745, 3689, 4875 and 78964.

Find the average of the following:—

4. 5 and 9; 7 and 13; 4, 8 and 15.

5. 9, 12, 16 and 19; 0, 7, 12, 15 and 21.

6. 26, 37, 49 and 60; 27, 0, 0, 16, 25 and 28.

7. A man trolling caught three fish; the 1st weighed 16 lb., the 2nd 11 lb., and the 3rd 15 lb. Find their average weight.

8. A's age is 45, B's 30, C's 35, D's 60, E's 70 years. What is the average of their ages?

9. A man sold goods in six days to the following amounts: $80, $75, $92, $64, $210, $193. What did his sales average per day?

10. Seven houses are worth, respectively, $10000, $12000, $8500, $7525, $4260, $4180, and $3200. What is their average value?

EXERCISE CI.

1. The average weight of 9 boys is 73 lb. 5 oz. Find their aggregate weight.

2. The average speed of a train for 12 hours is 21 mi. 120 rd. Find the distance travelled during that time.

3. A farmer sells 6 loads of wheat having an average of 45 bu. 30 lb. per load. Find the value of the 6 loads at 75 ct. per bushel.

4. A woman sells 12 turkeys of an average weight of 13 lb. 8 oz. What did she receive for the lot, turkeys being worth 11 ct. per lb.

5. A farmer brought to market a load of 15 hogs of an average weight of 2 cwt. 35 lb. What was the aggregate weight of the hogs?

6. The aggregate weight of 9 turkeys is 113 lb. 1 oz. What is the average weight of a turkey?

7. A train goes 333 mi. in 10 hr. What is the average speed per hour?

8. In one of the classes in a school the aggregate attendance for the week was 225. What was the average attendance each of the five days?

9. A earns $3900 in a year. What does he earn each week, there being 52 wks. in a year.

10. The aggregate weight of 24 tubs of butter is 591 lb. Find the average weight of a tub.

EXERCISE CII.

1. Bought 1 cow for $36, and 2 others for $30 a piece. What was their average cost?

2. A grocer mixes 9 lb. of sugar at 5 ct. a pound with 18 lb. at 8 ct. a pound. What is a pound of the mixture worth?

3. A jeweler mixes 20 oz. of gold 18 carats fine with 12 oz. 10 carats fine. How fine is the mixture?

4. A grocer sold 7 lb. of tea at 55 ct. per lb. and 21 lb. at 35 ct. per lb. What was the average price?

5. A grocer mixed 20 lb. of sugar of a certain kind with 40 lb. worth 9 ct. per lb. The whole was worth 8 ct. per lb. What was the price of the first kind of sugar?

6. I bought 500 bu. of wheat, part at 70 ct. per bu. and the rest at 75 ct. per bu. The average price was 72 ct. per bu. How many bu. of each kind did I buy?

7. The average height of 4 boys is 5 ft. 1 in. What is the height of a fifth boy, the average height of the five being 4 ft. 11 in.?

8. The aggregate weight of 5 men is 800 lb. The aggregate weight of three of them is 522 lb. Find the average weight of the other two.

9. A person mixes 1 lb. of his best coffee with 5 lbs. at 1s. 4d. a lb., and produces a mixture worth 1s. 4½d. a lb. What is the price of his best coffee?

10. If 15 lb. of sugar are bought at 4d., and 24 lb. at 6½d., and if the two quantities are then mixed and sold at 7d., how much will be gained?

EXERCISE CIII.

1. The weights of some hogs are as follows: 250, 320, 275, 322, 415, 213, 244, 214 and 195 pounds. What is the average of their weights and their aggregate weight?

2. In 1898 the value of hay and clover grown in the counties bordering on Lake Erie was as follows:—Essex $530193, Kent $693773, Elgin $639646, Norfolk $404300, Haldimand $597953, and Welland $559775. What was the average value of this crop per county?

3. If a doz. eggs weigh 1 lb. 8 oz., what is their average weight?

4. A merchant mixes 4 lb. of coffee worth 32 ct. a pound 3 lb. worth 35 ct. and 2 lb. worth 41 ct. What is the mixture worth a pound?

5. Of candidates for office, 7 were 20 yrs. old, 12 were 22, 12 were 23, and 1, 24. What was the average age of the candidates?

6. A drover bought 30 cows at $22 a head, 40 at $25 a head, 30 at $28 a head. What was the average price per head?

7. A merchant mixed 24 lb. of sugar at 5 cents a pound, 30 lb. at 6 ct. and 26 lb. at 10 ct. What is the average price of the mixture?

8. A merchant bought 2000 lb. of wool at 47 ct. per pound, 3000 lb. at 43 ct., 5000 lb. at 49 ct. and 8000 lb. at 45 ct. What was the average cost per lb.?

9. In a factory a certain number of men receive $13 each per week, 4 times as many receive $9 each per week, and 10 times as many receive $5 each per week. What is the average weekly wage per man?

10. A goldsmith combined 8 oz. of gold 21 carats fine, 12 oz. 22 carats fine, 18 oz. 20 carats fine, with 28 oz. of alloy; required the fineness of the composition.

CHAPTER V.

FACTORS, CANCELLATION, MEASURES, AND MULTIPLES.

I. FACTORS.

Whole Numbers, or Integers, are either *Odd* or *Even*.

An Odd Number is a number not exactly divisible by 2, as 7, 9, &c.

An Even Number is a number exactly divisible by 2, as 8, 10, &c.

A Factor of a number is a number which will divide the given number exactly, as 2, 3, 4 or 6 is a factor of 12.

A Prime Number is one which has no integral factors, except *itself* and *one*, as 13.

A Composite Number is one which has other integral factors than itself and one, as 12.

The Prime Factors of a composite number are the prime numbers which, multiplied together, produce that number; thus, 2, 3 and 5 are the prime factors of 30.

EXERCISE CIV.

Find the prime factors of the following:—

1. 12 56 84 30.
2. 196 231 252 384.
3. 876 948 1052 1059.
4. 1095 1113 1127 1156.
5. 1202 1214 1218 1555.

Find the prime numbers in the following:—

6. 781 797 821 1437.
7. 1157 1187 2067 2117.
8. 2543 2521 2007 2013.
9. 2273 2339 2417 2967.
10. 3397 3197 3013 3119.

EXERCISE CV.

Find the prime factors common to the following:—

1. 50 and 70 — 140 and 385.
2. 105 and 231 — 429 and 1001.
3. 595 and 1547 — 888 and 948.
4. 484 and 476 — 648 and 540.
5. 720 and 748 — 960 and 925.
6. Write the numbers less than 100 of which 3 is a factor.
7. Write the numbers between 700 and 800 of which 11 is a factor.
8. Find the largest factor other than the number itself of each of the following numbers:—60, 125, 825, 579, and 886.
9. Find three prime numbers that will divide each of the following:—30, 105, 385, 1001, 3553.
10. Resolve the following into as many pairs of factors as possible:—60, 150, 100, 240, 360.

II. CANCELLATION.

Cancellation is the process of rejecting equal factors from both Dividend and Divisor, and thereby greatly shortening the operation of Division.

EXERCISE CVI.

1. Divide $15\times16\times18\times20$ by $5\times8\times3\times4$.
2. Divide $7\times24\times30\times35$ by $14\times36\times70$.
3. Divide $60\times66\times80\times90$ by $15\times20\times88\times180$.
4. Divide $75\times85\times120\times114$ by $57\times102\times125$.
5. Divide $48\times54\times60\times72$ by $36\times54\times18\times80$.
6. Divide the continued product of 7, 8, 9, 12, 18 and 24 by the continued product of 3, 4, 6, 6, and 6.
7. Divide the continued product of 16, 18, 20, 24, 25 and 27 by the continued product of 4, 9, 30, and 36.
8. A lot is planted with potatoes. There are 75 rows; each row has 120 hills, and each hill has on an average 16 potatoes. How many bushels are there, if it takes 20 potatoes to fill a gallon?
9. Five pieces of cloth, each containing 60 yd., worth $1.50 per yard, are exchanged for 6 pieces, worth $1 per yard. How many yards are there in each piece of the latter?
10. A bicycle rider goes at the rate of 10 miles per hour for 12 hours a day during 16 days. How many days must another ride at the rate of 8 miles per hour for 6 hours per day to go as far?

III. MEASURES.

A Measure of a number is one of the factors of that number.

A Common Measure of two or more numbers is a factor common to the given numbers.

The Greatest Common Measure (G.C.M.) of two or more numbers is the largest factor common to the given numbers.

Numbers that have no common factor other than one are said to be prime to one another.

EXERCISE CVII.

Find the G.C.M. of:—

1.	42 and 56	48 and 128	65 and 91.
2.	210 and 455	230 and 506	210 and 294.
3.	288 and 360	352 and 384	336 and 884.
4.	27, 36, 108	32, 48, 128	56, 63, 315.
5.	75, 225, 500	210, 462, 546	546, 462, 882.
6.	216, 360, 405	168, 132, 352	146, 365, 219.
7.	365, 511, 803	192, 576, 1760	671, 781, 1441.
8.	639, 873, 747	808, 568, 1112	455, 403, 481.
9.	352, 992, 672	550, 770, 1210	154, 210, 420.
10.	1001, 1365, 1820	715, 1001, 1287	1615, 969, 2261.

EXERCISE CVIII.

1. What is the length of the longest pole that will measure 84 ft., 56 ft., and 70 ft.?

2. What is the length of the longest stick that will measure 15 ft. 7 in. and 18 ft. 5 in.?

3. What is the largest number that will divide 202 and 266 so as to leave 7 and 11 as remainders respectively?

4. What is the greatest equal length into which three trees can be cut, the first being 84 ft. long, the second 105 ft., and the third 119 ft.?

5. What is the greatest width of carpet that will fit three rooms—the first being 18 ft. wide, the second 22 ft. 6 in. wide, and the third 29 ft. 3 in.?

6. A rectangular field 611 ft. by 364 ft. is fenced with rails of equal length, and this the greatest possible. The fence being straight, what is the length of a rail?

7. A farmer has 441 bu. of oats, 567 bu. of wheat, and 315 bu. of rye. He wishes to make exact loads of the same number of bushels of each kind of grain, and have as few loads as possible. How many bushels will there be in a load?

8. Three debts of $200, $250 and $300 were paid with bills of the same denomination. How might the debt have been paid? How was it paid if the bills were the largest possible?

9. B has $620, C $1116, and D $1488, with which they agree to purchase horses at the highest price per head that will allow each man to invest all his money? What will be the cost of each horse?

10. How many rails will inclose a rectangular field 14599 feet long by 10361 feet wide, provided the fence is straight, and 7 rails high, and the rails of equal length, and the longest that can be used?

EXERCISE CIX.

Find the G.C.M. of the following:—

1.	1008 and 1026	1225 and 2247	2761 and 3263.
2.	1391 and 2247	1866 and 3421	1957 and 2987.
3.	4004 and 5772	4427 and 7219	7813 and 9015.
4.	2542 and 5487	4735 and 6629	3029 and 3961.
5.	2951 and 3477	4559 and 7003	4055 and 7299.
6.	8128 and 8472	5544 and 8008	7956 and 9724.
7.	15444 and 13068	69615 and 92872	23673 and 60203.
8.	45862 and 29026	43155 and 81564	53712 and 65961.
9.	15249 and 27807	30429 and 88641	18577 and 20006.
10.	13230, 44100, and 118125	720100, 913330, and 211109.	

EXERCISE CX.

1. Find the G.C.M. of 1365 and 1785, and from this find all the common measures of these two numbers.

2. Find the G.C.M. of 37 d. 13 hr. and 55 d. 5 hr.

3. Find the G.C.M. of 7 mi. 259 yd. and 11 mi. 407 yd.

4. Find the G.C.M. of 6 bu. 1 pk. 1 gal. and 10 bu. 3 pk. 1 gal.

5. What is the largest number that will divide 2000 leaving a remainder of 11, and 2708 leaving a remainder of 17?

6. Find the greatest number that will divide 13956 and 14565, and leave a remainder of 7 in each case.

7. Find the greatest number that will divide 2293, 4245 and 5348, and leave remainders 18, 20 and 23 respectively.

8. What is the largest number of men amongst whom 209 apples and 361 oranges can be distributed, so that every man gets as many apples and as many oranges as any other man?

9. Two masses of silver, weighing 1169 oz. and 1393 oz., respectively, are each to be made, without loss, into medals of the same weight. What is the weight of the largest possible medal?

10. A farmer has 1134 sheep and 1260 lambs. He forms them into separate flocks, with the same number of animals in each flock. The flocks being the largest possible, how many animals are in each?

IV. MULTIPLES.

A Multiple of a number is the product obtained by multiplying the given number by any whole number.

Thus, if 7 is multiplied successively by 1, 2, 3, 4, 5, &c., the products 7, 14, 21, 28, 35, &c., are multiples of 7.

From this, it follows that every multiple of a number is exactly divisible by that number.

A Common Multiple of two or more numbers is a number which is one or more times each of the given numbers.

Thus, 24 is a common multiple of 2, 3, 4, 6, 8, &c.

The Least Common Multiple (L.C.M.) of two or more numbers is the least number that is one or more times each of the given numbers.

EXERCISE CXI.

Find the L.C.M. of the following:—

1.	4, 6, 8	6, 8, 10	8, 10, 12.
2.	5, 15, 25	25, 30, 40	36, 48, 60.
3.	5, 7, 9	12, 13, 17	13, 15, 19.
4.	12, 18, 24, 30	18, 30, 36, 42	24, 36, 42, 56.
5.	32, 48, 64, 72	30, 40, 50, 60	60, 66, 72, 77.
6.	14, 18, 20, 21	51, 187, 153, 165	203, 429, 494, 570.
7.	165, 198, 242	312, 429, 572, 715	287, 451, 455, 715.
8.	510, 595, 680	432, 840, 693, 660	253, 345, 414, 495.
9.	1955, 2001, 3451	2041, 8476, 3423	2743, 4009, 4199.
10.	1554, 1658, 18658	4410, 7350, 7875	2001, 4278, 4495.

EXERCISE CXII.

1. Find the L.C.M. of the first six even numbers.

2. Find the smallest number of apples that can be arranged in groups of 8, or 9, or 15, or 20 each.

3. Find the L.C.M. of the prime numbers between 4 and 18.

4. Find the L.C.M. of all the odd numbers between 8 and 16.

5. What is the least number from which 16 and 24 may each be taken an integral number of times?

6. Find the least number that can be divided by 7, 20, 28 and 35 respectively and leave 3 as remainder in each case.

7. What number is the same multiple of 7 that 1962 is of 9?

8. Divide the L.C.M. of 23949 and 26610 by their G.C.M.

9. What is the shortest piece of wire that can be cut into exact lengths of either 6 ft., 8 ft. or 10 ft.?

10. What is the capacity of the smallest cistern the full contents of which will exactly fill a four-gallon, a ten-gallon or a fifteen-gallon measure a certain number of times?

EXERCISE CXIII.

1. What is the smallest debt that can be paid with an exact number of 2-dollar, or 4-dollar, or 10-dollar bills?

2. What is the greatest weight of which 1 t. 19 cwt. 48 lb. and 4 t. 14 cwt. 47 lb. are multiples?

3. What is the greatest weight of which 2 t. 4 cwt. 18 lb. and 5 t. 4 cwt. 34 lb. are multiples?

4. How often does the L.C.M. of 5, 12, 36, 42 and 84 contain the G.C.M. of 7266 and 8022?

5. A rides at the rate of 6 miles per hour, B at the rate of 10 miles per hour, and C walks at the rate of 3 miles per hour. Find the shortest distance each may go in an integral number of hours.

6. What is the least number which divided by 8, 9, 10 and 12 respectively gives in each case a remainder of 5?

7. What numbers less than 200 leave 2 as remainder when divided by 3, or 4, or 5, or 6.

8. What is the smallest quantity of wheat that can be taken to market in either 20, 25, 30, or 40 bushel loads?

9. The product of four consecutive numbers is 43680. What are the numbers?

10. One pound Avoirdupois weight contains 7000 gr. and one pound Troy weight 5760 gr. Find the least weight which can be expressed integrally in both Troy and Avoirdupois pounds.

CHAPTER VI.

FRACTIONS.

I. DEFINITIONS, NOTATION AND NUMERATION.

A Fraction is a number which expresses one or more equal parts of a *whole*, or *unit*.

A Common or Vulgar Fraction is expressed by two numbers, one above and the other below a short horizontal line; thus $\frac{4}{5}$, $\frac{7}{10}$, and $\frac{9}{13}$ are Common, or Vulgar fractions.

The Denominator is the number below the line, and shows into how many equal parts the whole, or unit is divided.

The Numerator is the number above the line, and shows the number of equal parts in the fraction.

The numerator and denominator are called the **Terms** of the fraction.

A fraction indicates also the **quotient** arising from dividing the numerator by the denominator. Thus $\frac{4}{5}$ means

i. Four of the parts when a unit is divided into five equal parts.

ii. The quotient when four is divided by five.

iii. One-fifth of four units.

EXERCISE CXIV.

Express in figures:—

1. Two-thirds; Three-fourths; Four-fifths.
2. Five-eighths; Five-ninths; Five-twelfths.
3. Six-sevenths; Six-thirteenths; Six-seventeenths.
4. Seven-twenty firsts; Seven-twelfths; Seven-thirty seconds.

Write in words:—

5. $\frac{2}{3}$ $\frac{3}{5}$ $\frac{4}{7}$ $\frac{3}{11}$.
6. $\frac{7}{12}$ $\frac{11}{21}$ $\frac{19}{22}$ $\frac{17}{25}$.
7. $\frac{17}{31}$ $\frac{11}{12}$ $\frac{19}{32}$ $\frac{11}{51}$.

Explain the meaning of the following fractions:—

8. $\frac{2}{3}$ in. $\frac{3}{4}$ ft. $\frac{4}{5}$ a. $\$\frac{7}{10}$.
9. $\frac{7}{9}$ hr. $\frac{11}{12}$ $\frac{13}{21}$ $\frac{7}{25}$.
10. $\frac{5}{7}$ cord. $\frac{17}{25}$ cwt. $\frac{7}{8}$ lb. $\frac{5}{12}$ t.

II. REDUCTION.

A Proper Fraction is one of which the numerator is less than the denominator, as $\frac{2}{3}$, $\frac{7}{8}$.

An Improper Fraction is one of which the numerator is equal to or greater than the denominator, as $\frac{7}{7}$, $\frac{14}{9}$.

A Mixed Number is a number which consists of the sum of a whole number and a fraction, as $2\frac{1}{4}$.

A fraction is in its **lowest terms** when the numerator and denominator are prime to each other.

Similar Fractions are those that have a common denominator, as $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$ and $\frac{11}{8}$.

When the terms of a fraction are both multiplied by the same number or are both divided by the same number, the value of the fraction is not altered.

A Simple Fraction is one in which the terms are both whole numbers and which expresses one or more of the equal parts of unity, as $\frac{2}{3}$, $\frac{4}{7}$.

A Compound Fraction is one which expresses one or more of the equal parts of a fraction, as $\frac{1}{2}$ of $\frac{2}{3}$, $\frac{2}{3}$ of $\frac{5}{7}$.

A Complex Fraction is one in which one or both terms are fractions, as $\frac{2\frac{1}{2}}{5}$, $\frac{4}{3\frac{1}{4}}$, $\frac{2\frac{1}{4}}{3\frac{1}{5}}$.

EXERCISE CXV.

Reduce to improper fractions:—

1. $2\frac{1}{2}$ $4\frac{1}{3}$ $2\frac{3}{5}$ $4\frac{3}{4}$.
2. $6\frac{1}{7}$ $7\frac{1}{8}$ $8\frac{1}{9}$ $4\frac{2}{7}$.
3. $5\frac{3}{8}$ $6\frac{7}{9}$ $8\frac{1}{11}$ $9\frac{4}{31}$.
4. $18\frac{1}{3}$ $19\frac{3}{4}$ $21\frac{1}{2}$ $25\frac{3}{5}$.
5. $43\frac{7}{11}$ $101\frac{3}{5}$ $14\frac{13}{15}$ $26\frac{21}{202}$.
6. $163\frac{4}{15}$ $275\frac{3}{17}$ $461\frac{25}{99}$ $403\frac{17}{21}$.
7. $207\frac{16}{25}$ $850\frac{11}{81}$ $908\frac{37}{39}$ $78\frac{147}{251}$.
8. $310\frac{7}{43}$ $569\frac{17}{78}$ $678\frac{47}{103}$ $698\frac{49}{230}$.
9. $1001\frac{5}{17}$ $96\frac{145}{801}$ $8080\frac{67}{97}$ $7000\frac{7}{101}$.
10. $7018\frac{9}{41}$ $705\frac{368}{707}$ $368\frac{249}{784}$ $37\frac{41}{5698}$.

EXERCISE CXVI.

1. John has two apples. To how many boys can he give half an apple?

2. Among how many girls must 3 melons be divided that each may receive $\frac{1}{4}$ of a melon?

3. How many fifths are there in 6 apples?

4. How many persons will $5\frac{1}{2}$ cords of wood supply, if each one receives $\frac{1}{2}$ cord?

5. A gave $\$\frac{1}{4}$ to each one of a number of boys. He gave away $\$3\frac{3}{4}$. How many boys were there?

6. Express both 5 and 7 as fractions with denominator 15.

7. Change 48 to ninths and 57 to tenths.

8. What fractions with denominator 24 are equivalent to 3, 5, 8, and 12, respectively?

9. A walked a mile each quarter hour. He walked for $3\frac{1}{4}$ hours. How far did he go?

10. To make badges $\frac{1}{6}$ yd. long for a class, $5\frac{5}{6}$ yd. of ribbon are needed. How many pupils are there in the class?

EXERCISE CXVII.

Reduce to whole numbers or to mixed numbers:—

1. $\frac{5}{2}$ $\frac{7}{3}$ $\frac{13}{4}$ $\frac{12}{6}$.
2. $\frac{15}{8}$ $\frac{19}{7}$ $\frac{31}{6}$ $\frac{35}{12}$.
3. $\frac{85}{12}$ $\frac{65}{13}$ $\frac{78}{14}$ $\frac{91}{17}$.
4. $\frac{219}{24}$ $\frac{389}{23}$ $\frac{703}{21}$ $\frac{888}{25}$.

5. $\frac{637}{125}$ $\frac{541}{123}$ $\frac{978}{151}$ $\frac{1000}{73}$.
6. $\frac{8000}{1760}$ $\frac{6001}{23}$ $\frac{5231}{323}$ $\frac{1718}{1133}$.
7. $\frac{4919}{240}$ $\frac{7001}{727}$ $\frac{6897}{1931}$ $\frac{76849}{2237}$.
8. $\frac{7684}{23}$ $\frac{8301}{83}$ $\frac{6081}{607}$ $\frac{8567}{853}$.
9. $\frac{8036}{401}$ $\frac{412}{9}$ gal. $\frac{376}{7}$ da. $\frac{253}{5}$ lb.
10. $\frac{1925}{271}$ mi. $\frac{764}{31}$ cords. $\frac{369}{17}$ yd. $\frac{694}{11}$ oz.

EXERCISE CXVIII.

1. How much money has John who has $\$\frac{17}{4}$?

2. If a basket of peaches holds $\frac{1}{4}$ bu., how many bushels are there in 369 baskets?

3. A walked from X to Y at the rate of a mile each $\frac{1}{4}$ hr. He walked $\frac{19}{4}$ hr. How far is it from X to Y?

4. A druggist has 97 packages of medicine, each weighing $\frac{1}{6}$ lb. How many pounds does the medicine weigh?

5. How many bushels of wheat are there in 964 bags, each containing $\frac{1}{3}$ bu.?

6. Which is the heavier—786 packages, each holding $\frac{1}{5}$ lb., or 629 packages, each holding $\frac{1}{4}$ lb.?

7. Express $\frac{77}{7}$ in., $\frac{91}{13}$ lb., $\frac{125}{5}$ oz., each as a whole number.

8. A bottle holds $\frac{1}{8}$ gal. of wine. How many gallons are there in 5 doz. such bottles?

9. The perimeter of a rectangular room is $\frac{216}{3}$ ft. It is four feet longer than wide. Find the length and width of the room.

10. A farmer sold a load of oats consisting of 79 bu. at $\$\frac{1}{4}$ per bushel. How much did he get for the load?

EXERCISE CXIX.

1. Reduce $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$, each to twelfths.
2. “ $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{6}$, “ twenty-fourths.
3. “ $\frac{2}{3}$, $\frac{5}{6}$ and $\frac{5}{9}$, “ eighteenths.
4. “ $\frac{3}{4}$, $\frac{4}{5}$ and $\frac{7}{10}$, “ twentieths.
5. “ $\frac{2}{5}$, $\frac{2}{3}$ and $\frac{3}{10}$, “ thirtieths.
6. “ $\frac{2}{3}$, $\frac{5}{6}$ and $\frac{3}{8}$, “ twenty-fourths.
7. “ $\frac{4}{5}$, $\frac{3}{10}$ and $\frac{11}{15}$, “ thirtieths.
8. “ $\frac{2}{3}$, $\frac{5}{6}$ and $\frac{3}{7}$, “ forty-seconds.
9. “ $\frac{5}{8}$, $\frac{7}{12}$ and $\frac{3}{16}$, “ forty-eighths.
10. “ $\frac{5}{6}$, $\frac{7}{10}$ and $\frac{11}{12}$, “ sixtieths.

EXERCISE CXX.

1. Reduce $\frac{3}{12}$, $\frac{5}{20}$ and $\frac{21}{28}$, each to fourths.
2. " $\frac{15}{25}$, $\frac{7}{35}$ and $\frac{18}{45}$, " fifths.
3. " $\frac{15}{21}$, $\frac{20}{35}$ and $\frac{35}{49}$, " sevenths.
4. " $\frac{15}{27}$, $\frac{20}{36}$ and $\frac{10}{18}$, " ninths.
5. " $\frac{20}{44}$, $\frac{42}{66}$ and $\frac{49}{77}$, " elevenths.
6. " $\frac{26}{36}$, $\frac{25}{90}$ and $\frac{28}{72}$, " eighteenths.
7. " $\frac{26}{40}$, $\frac{44}{80}$ and $\frac{51}{60}$, " twentieths.
8. " $\frac{14}{48}$, $\frac{15}{72}$ and $\frac{20}{96}$, " twenty-fourths.
9. " $\frac{66}{93}$, $\frac{35}{217}$ and $\frac{143}{341}$, " thirty-firsts.
10. " $\frac{68}{208}$, $\frac{91}{364}$ and $\frac{276}{624}$, " fifty-seconds.

EXERCISE CXXI.

1. Supply numerators in $\frac{2}{3}=\frac{8}{12}$ $\frac{3}{5}=\frac{12}{20}$ $\frac{5}{7}=\frac{15}{21}$.
2. " " " $\frac{4}{7}=\frac{20}{35}$ $\frac{5}{9}=\frac{15}{27}$ $\frac{7}{11}=\frac{35}{55}$.
3. " " " $\frac{5}{8}=\frac{25}{40}$ $\frac{6}{13}=\frac{36}{78}$ $\frac{5}{17}=\frac{25}{85}$.
4. " " " $\frac{12}{16}=\frac{3}{4}$ $\frac{15}{25}=\frac{3}{5}$ $\frac{14}{28}=\frac{2}{4}$.
5. " " " $\frac{84}{144}=\frac{7}{12}$ $\frac{75}{100}=\frac{3}{4}$ $\frac{55}{132}=\frac{5}{12}$.
6. Supply denominators in $\frac{5}{8}=\frac{25}{40}$ $\frac{7}{11}=\frac{28}{[illegible]}$ $\frac{11}{13}=\frac{44}{[illegible]}$.
7. " " " $\frac{5}{17}=\frac{35}{[illegible]}$ $\frac{11}{19}=\frac{121}{209}$ $\frac{9}{17}=\frac{63}{[illegible]}$.
8. " " " $\frac{11}{12}=\frac{154}{168}$ $\frac{6}{17}=\frac{72}{204}$ $\frac{9}{29}=\frac{81}{261}$.
9. " " " $\frac{6}{12}=\frac{1}{2}$ $\frac{8}{24}=\frac{1}{3}$ $\frac{9}{15}=\frac{3}{[illegible]}$.
10. " " " $\frac{8}{12}=\frac{2}{3}$ $\frac{38}{76}=\frac{2}{3}$ $\frac{144}{204}=\frac{12}{17}$.

EXERCISE CXXII.

Reduce to equivalent fractions in lowest terms:

1. $\frac{4}{8}$ $\frac{9}{12}$ $\frac{6}{9}$ $\frac{7}{28}$.
2. $\frac{14}{30}$ $\frac{27}{45}$ $\frac{42}{48}$ $\frac{36}{63}$.
3. $\frac{80}{112}$ $\frac{90}{198}$ $\frac{72}{280}$ $\frac{150}{225}$.
4. $\frac{46}{276}$ $\frac{159}{371}$ $\frac{209}{275}$ $\frac{221}{260}$.
5. $\frac{302}{755}$ $\frac{192}{576}$ $\frac{365}{511}$ $\frac{315}{745}$.
6. $\frac{492}{744}$ $\frac{319}{5687}$ $\frac{1428}{1530}$ $\frac{1144}{9900}$.
7. $\frac{2640}{2970}$ $\frac{2755}{3515}$ $\frac{2651}{7271}$ $\frac{2268}{3444}$.
8. $\frac{1242}{2323}$ $\frac{3062}{4593}$ $\frac{3265}{99100}$ $\frac{4707}{6799}$.
9. $\frac{5608}{7711}$ $\frac{21120}{71040}$ $\frac{25194}{88179}$ $\frac{6539}{12963}$.
10. $\frac{3100}{10925}$ $\frac{22977}{28971}$ $\frac{374192}{575680}$ $\frac{30673}{271469}$.

EXERCISE CXXIII.

Reduce to equivalent fractions having least common denominator:

1. $\frac{2}{3}$ and $\frac{5}{6}$ $\frac{7}{8}$ and $\frac{5}{16}$ $\frac{5}{12}$ and $\frac{17}{24}$.
2. $\frac{3}{7}$ and $\frac{8}{21}$ $\frac{4}{5}$ and $\frac{7}{25}$ $\frac{9}{11}$ and $\frac{17}{77}$.
3. $\frac{1}{2}$ and $\frac{1}{3}$ $\frac{1}{3}$ and $\frac{1}{5}$ $\frac{1}{5}$ and $\frac{1}{6}$.
4. $\frac{2}{3}$ and $\frac{3}{5}$ $\frac{3}{7}$ and $\frac{5}{9}$ $\frac{4}{11}$ and $\frac{3}{5}$.
5. $\frac{7}{8}$ and $\frac{7}{9}$ $\frac{5}{7}$ and $\frac{3}{11}$ $\frac{4}{7}$ and $\frac{5}{13}$.
6. $\frac{7}{12}$ and $\frac{8}{17}$ $\frac{9}{11}$ and $\frac{7}{21}$ $\frac{6}{13}$ and $\frac{7}{23}$.
7. $\frac{3}{5}$ and $\frac{5}{18}$ $\frac{4}{19}$ and $\frac{7}{16}$ $\frac{3}{13}$ and $\frac{7}{25}$.
8. $\frac{5}{12}$ and $\frac{7}{18}$ $\frac{4}{9}$ and $\frac{11}{15}$ $\frac{7}{12}$ and $\frac{17}{21}$.
9. $\frac{7}{16}$ and $\frac{19}{24}$ $\frac{13}{18}$ and $\frac{23}{27}$ $\frac{11}{35}$ and $\frac{17}{42}$.
10. $\frac{11}{24}$ and $\frac{5}{36}$ $\frac{15}{28}$ and $\frac{6}{35}$ $\frac{23}{24}$ and $\frac{59}{84}$.

EXERCISE CXXIV.

Reduce to equivalent fractions with least common denominator:

1. $\frac{4}{9}$, $\frac{5}{12}$ and $\frac{7}{15}$ $\frac{3}{7}$, $\frac{5}{14}$ and $\frac{4}{49}$.
2. $\frac{5}{6}$, $\frac{4}{25}$ and $\frac{7}{30}$ $\frac{2}{11}$, $\frac{5}{13}$ and $\frac{7}{26}$.
3. $\frac{7}{12}$, $\frac{5}{36}$ and $\frac{11}{48}$ $\frac{3}{19}$, $\frac{5}{38}$ and $\frac{1}{6}$.
4. $\frac{6}{7}$, $\frac{7}{12}$, $\frac{20}{63}$ and $\frac{13}{84}$ $\frac{2}{5}$, $\frac{2}{3}$, $\frac{2}{9}$ and $\frac{7}{10}$.
5. $\frac{5}{12}$, $\frac{17}{18}$, $\frac{23}{24}$ and $\frac{7}{36}$ $\frac{3}{4}$, $\frac{5}{7}$, $\frac{8}{21}$ and $\frac{17}{42}$.
6. $\frac{7}{12}$, $\frac{9}{16}$, $\frac{13}{20}$ and $\frac{11}{18}$ $\frac{11}{15}$, $\frac{17}{20}$, $\frac{7}{12}$ and $\frac{19}{24}$.
7. $\frac{5}{12}$, $\frac{17}{24}$, $\frac{9}{10}$ and $\frac{4}{25}$ $\frac{17}{24}$, $\frac{13}{21}$, $\frac{11}{14}$ and $\frac{15}{28}$.
8. $\frac{8}{15}$, $\frac{13}{20}$, $\frac{7}{12}$ and $\frac{11}{24}$ $\frac{17}{20}$, $\frac{5}{12}$, $\frac{13}{24}$ and $\frac{7}{10}$.
9. $\frac{7}{9}$, $\frac{5}{18}$, $\frac{7}{54}$ and $\frac{11}{36}$ $\frac{5}{11}$, $\frac{5}{7}$, $\frac{11}{21}$ and $\frac{13}{77}$.
10. $\frac{2}{9}$, $\frac{7}{11}$, $\frac{40}{33}$ and 2 $\frac{18}{25}$, $\frac{23}{45}$, $\frac{25}{18}$ and 7.

EXERCISE CXXV.

Which is the greatest and which the least of the following fractions?

1. $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{4}{5}$ $\frac{3}{4}$, $\frac{4}{5}$ and $\frac{5}{6}$.
2. $\frac{17}{21}$, $\frac{6}{7}$ and $\frac{5}{6}$ $\frac{2}{3}$, $\frac{7}{12}$ and $\frac{3}{5}$.
3. $\frac{3}{4}$, $\frac{8}{11}$ and $\frac{41}{55}$ $\frac{4}{7}$, $\frac{8}{15}$ and $\frac{4}{9}$.
4. $\frac{5}{16}$, $\frac{7}{24}$, $\frac{9}{28}$ and $\frac{11}{36}$ $\frac{9}{10}$, $\frac{17}{20}$, $\frac{21}{25}$ and $\frac{53}{60}$.

Arrange the following fractions in order of magnitude:—

5. $\frac{11}{30}$, $\frac{12}{35}$, $\frac{17}{42}$ and $\frac{7}{20}$ $\frac{5}{24}$, $\frac{7}{36}$, $\frac{11}{54}$ and $\frac{15}{64}$.
6. $\frac{2}{7}$, $\frac{3}{8}$, $\frac{5}{13}$ and $\frac{36}{91}$ $\frac{4}{9}$, $\frac{7}{12}$, $\frac{11}{20}$ and $\frac{13}{24}$.
7. $\frac{7}{20}$, $\frac{5}{16}$, $\frac{13}{40}$ and $\frac{23}{60}$ $\frac{5}{12}$, $\frac{7}{18}$, $\frac{11}{25}$ and $\frac{17}{30}$.

8. Find a fraction with 60 for denominator intermediate in value between $\frac{4}{5}$ and $\frac{5}{6}$.

9. Find a fraction with 84 for denominator greater than $\frac{5}{6}$ and less than $\frac{6}{7}$.

10. Find a fraction with 72 for denominator as much less than $\frac{5}{9}$ as it is greater than $\frac{5}{12}$.

EXERCISE CXXVI.

Reduce the following compound fractions to simple ones:—

1. $\frac{1}{2}$ of $\frac{6}{11}$ $\frac{1}{3}$ of $\frac{12}{17}$ $\frac{1}{4}$ of $\frac{8}{9}$.
2. $\frac{2}{3}$ of $\frac{6}{7}$ $\frac{3}{4}$ of $\frac{8}{11}$ $\frac{5}{6}$ of $\frac{12}{13}$.
3. $\frac{3}{7}$ of $\frac{14}{17}$ $\frac{4}{5}$ of $\frac{25}{29}$ $\frac{7}{8}$ of $\frac{32}{41}$.
4. $\frac{1}{3}$ of $\frac{1}{5}$ $\frac{1}{2}$ of $\frac{1}{11}$ $\frac{1}{5}$ of $\frac{7}{8}$.
5. $\frac{2}{3}$ of $\frac{5}{7}$ $\frac{3}{7}$ of $\frac{5}{11}$ $\frac{7}{8}$ of $\frac{15}{19}$.
6. $\frac{2}{3}$ of $4\frac{1}{2}$ $\frac{3}{5}$ of $4\frac{3}{4}$ $\frac{5}{7}$ of $4\frac{1}{5}$.
7. $\frac{4}{9}$ of 36 $\frac{7}{8}$ of 56 $\frac{5}{12}$ of 72.
8. $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$ $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ $\frac{5}{7}$ of $\frac{7}{8}$ of $\frac{12}{25}$.
9. $\frac{8}{9}$ of $\frac{45}{56}$ of $\frac{7}{10}$ $\frac{2}{3}$ of $\frac{5}{9}$ of $\frac{9}{25}$ $\frac{5}{8}$ of $\frac{3}{11}$ of $\frac{22}{39}$.
10. $2\frac{2}{7}$ of $6\frac{2}{5}$ of $1\frac{7}{8}$ of $10\frac{1}{2}$ $3\frac{3}{4}$ of $3\frac{3}{5}$ of $10\frac{2}{3}$ of $7\frac{1}{9}$.

III. ADDITION OF FRACTIONS.

EXERCISE CXXVII.

Find the sum of:—

1. $\frac{4}{11}$, $\frac{2}{11}$, $\frac{3}{11}$ $\frac{1}{7}$, $\frac{2}{7}$, $\frac{3}{7}$ $\frac{2}{9}$, $\frac{1}{9}$, $\frac{5}{9}$.
2. $\frac{1}{12}$, $\frac{5}{12}$, $\frac{7}{12}$ $\frac{5}{17}$, $\frac{2}{17}$, $\frac{8}{17}$ $\frac{4}{13}$, $\frac{2}{13}$, $\frac{3}{13}$.
3. $\frac{1}{17}$, $\frac{4}{17}$, $\frac{9}{17}$ $\frac{2}{25}$, $\frac{9}{25}$, $\frac{8}{25}$ $\frac{4}{19}$, $\frac{5}{19}$, $\frac{9}{19}$.
4. $\frac{4}{5}$, $\frac{3}{4}$, $\frac{9}{20}$ $\frac{2}{7}$, $\frac{1}{3}$, $\frac{8}{21}$ $\frac{3}{8}$, $\frac{2}{3}$, $\frac{23}{24}$.
5. $\frac{4}{7}$, $\frac{3}{11}$, $\frac{12}{77}$ $\frac{3}{4}$, $\frac{5}{6}$, $\frac{5}{12}$ $\frac{3}{4}$, $\frac{4}{7}$, $\frac{9}{28}$.
6. $\frac{7}{8}$, $\frac{1}{6}$, $\frac{4}{9}$ $\frac{4}{9}$, $\frac{5}{6}$, $\frac{7}{15}$ $\frac{5}{6}$, $\frac{2}{3}$, $\frac{7}{12}$.
7. $\frac{2}{3}$, $\frac{5}{12}$, $\frac{13}{21}$ $\frac{7}{21}$, $\frac{11}{14}$, $\frac{13}{28}$ $\frac{7}{10}$, $\frac{13}{15}$, $\frac{17}{20}$.
8. $\frac{14}{15}$, $\frac{17}{35}$, $\frac{23}{28}$ $\frac{15}{28}$, $\frac{19}{35}$, $\frac{7}{20}$ $\frac{31}{36}$, $\frac{19}{24}$, $\frac{4}{27}$.
9. $\frac{10}{33}$, $\frac{15}{44}$, $\frac{17}{66}$ $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{7}$ $\frac{3}{5}$, $\frac{7}{8}$, $\frac{9}{11}$.
10. $\frac{2}{7}$, $\frac{3}{5}$, $\frac{4}{9}$ $\frac{2}{3}$, $\frac{3}{5}$, $\frac{7}{8}$ $\frac{5}{12}$, $\frac{3}{5}$, $\frac{7}{11}$.

EXERCISE CXXVIII.

1. Add $\frac{1}{4}$ to $\frac{1}{3}$ $\frac{1}{4}$ to $\frac{1}{5}$ $\frac{1}{5}$ to $\frac{1}{7}$.
2. Add $\frac{1}{5}$ to $\frac{1}{9}$ $\frac{1}{7}$ to $\frac{1}{11}$ $\frac{1}{9}$ to $\frac{1}{13}$.
3. Add $\frac{8}{9}$ to $\frac{8}{11}$ $\frac{8}{9}$ to $\frac{8}{15}$ $\frac{8}{9}$ to $\frac{8}{13}$.
4. Add $\frac{8}{9}$ to $\frac{8}{21}$ $\frac{4}{5}$ to $\frac{4}{7}$ $\frac{4}{7}$ to $\frac{4}{11}$.
5. Add $\frac{6}{7}$ to $\frac{6}{11}$ $\frac{6}{7}$ to $\frac{6}{13}$ $\frac{6}{11}$ to $\frac{6}{13}$.
6. Add $\frac{9}{10}$ to $\frac{9}{11}$ $\frac{9}{10}$ to $\frac{9}{14}$ $\frac{9}{10}$ to $\frac{9}{16}$.
7. Add $\frac{8}{15}$ to $\frac{8}{13}$ $\frac{8}{15}$ to $\frac{8}{21}$ $\frac{8}{15}$ to $\frac{8}{19}$.
8. Add $\frac{7}{9}$ to $\frac{7}{10}$ $\frac{7}{8}$ to $\frac{7}{12}$ $\frac{7}{8}$ to $\frac{7}{16}$.
9. Add $\frac{5}{6}$ to $\frac{5}{7}$ $\frac{5}{7}$ to $\frac{5}{8}$ $\frac{5}{9}$ to $\frac{5}{11}$.
10. Add $\frac{11}{12}$ to $\frac{11}{13}$ $\frac{11}{12}$ to $\frac{11}{15}$ $\frac{11}{15}$ to $\frac{11}{25}$.

EXERCISE CXXIX.

Simplify:—

1. $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5}$.
2. $\frac{2}{3} + \frac{3}{4} + \frac{4}{5} + \frac{5}{6} + \frac{7}{12}$.
3. $\frac{2}{7} + \frac{2}{21} + \frac{3}{28} + \frac{5}{16} + \frac{5}{12}$.
4. $\frac{7}{8} + \frac{4}{9} + \frac{3}{4} + \frac{5}{6} + \frac{2}{3} + \frac{11}{15}$.
5. $\frac{4}{5} + \frac{5}{12} + \frac{3}{16} + \frac{7}{18} + \frac{4}{27} + \frac{3}{20}$.
6. $2\frac{1}{4} + 3\frac{1}{4} + 7\frac{1}{4} + 5\frac{3}{4} + 6\frac{1}{4}$.
7. $7\frac{2}{11} + 3\frac{1}{11} + 4\frac{5}{11} + 6\frac{2}{11} + 8\frac{3}{11} + 6\frac{5}{11}$.
8. $2\frac{1}{3} + 3\frac{1}{4} + 4\frac{1}{5} + 5\frac{1}{6} + 2\frac{2}{5}$.
9. $7\frac{3}{8} + \frac{5}{6} + 2\frac{5}{12} + 7\frac{1}{8} + 6$.
10. $3\frac{1}{5} + 9\frac{1}{2} + 7\frac{9}{10} + 2 + 4\frac{7}{20}$.

EXERCISE CXXX.

1. John spent $\frac{1}{4}$ of his money on Monday, $\frac{1}{8}$ of it on Tuesday and $\frac{1}{6}$ of it on Wednesday. What part did he spend altogether?

2. A farmer has three fields; the first contains $10\frac{3}{8}$ acres, the second $9\frac{3}{4}$ acres, and the third $9\frac{5}{12}$ acres. How many acres had he in all?

3. How many pounds of butter are there in four tubs weighing respectively $27\frac{1}{3}$ lb., $24\frac{3}{8}$ lb., $30\frac{4}{5}$ lb., and $29\frac{5}{12}$ lb.

4. How many tons of coal are there in four loads weighing respectively $1\frac{1}{8}$ t., $1\frac{5}{6}$ t., $1\frac{3}{10}$ t. and $1\frac{7}{20}$ t.

5. What fraction is that which exceeds $\frac{2}{3}$ by $\frac{1}{4}$?

6. A weighs $172\frac{3}{8}$ lb.; B weighs $5\frac{4}{5}$ lb. more. How much does B weigh?

7. What number is that from which if $4\frac{4}{5}$ be taken the remainder will be $3\frac{22}{35}$?

8. One man rode $17\frac{5}{12}$ mi. Another rode $4\frac{5}{18}$ mi. farther. How far did the second one ride?

9. A grocer has 3 barrels of molasses. The first contains $33\frac{1}{2}$ gallons, the second $45\frac{1}{4}$ gallons, and the third $35\frac{5}{6}$ gallons. How many gallons are there in the 3 barrels?

10. On Monday A rode $35\frac{2}{7}$ mi., on Tuesday $40\frac{3}{28}$ mi., on Wednesday $36\frac{3}{4}$ mi. and on Thursday $20\frac{5}{14}$ mi. How far did he ride in the four days?

IV. SUBTRACTION OF FRACTIONS.

EXERCISE CXXXI.

Subtract:—

1. $\frac{1}{5}$ from $\frac{4}{5}$ $\frac{3}{7}$ from $\frac{5}{7}$. $\frac{8}{9}$ from $\frac{13}{9}$.
2. $\frac{4}{7}$ from $\frac{6}{7}$ $\frac{3}{15}$ from $\frac{11}{15}$ $\frac{5}{4}$ from $\frac{9}{4}$.
3. $\frac{3}{10}$ from $\frac{4}{5}$ $\frac{5}{16}$ from $\frac{7}{8}$ $\frac{2}{3}$ from $\frac{8}{9}$.
4. $\frac{4}{15}$ from $\frac{2}{3}$ $\frac{3}{7}$ from $\frac{35}{42}$ $\frac{4}{9}$ from $\frac{41}{63}$.
5. $\frac{3}{8}$ from $\frac{3}{4}$ $\frac{3}{4}$ from $\frac{11}{12}$ $\frac{3}{7}$ from $\frac{10}{21}$.
6. $\frac{3}{7}$ from $\frac{3}{5}$ $\frac{3}{8}$ from $\frac{3}{7}$ $\frac{7}{13}$ from $\frac{7}{11}$.
7. $\frac{9}{10}$ from $\frac{24}{25}$ $\frac{5}{12}$ from $\frac{4}{9}$ $\frac{5}{8}$ from $\frac{11}{12}$.
8. $\frac{13}{64}$ from $\frac{25}{36}$ $\frac{5}{16}$ from $\frac{11}{12}$ $\frac{19}{21}$ from $\frac{13}{14}$.
9. $\frac{41}{50}$ from $\frac{14}{15}$ $\frac{23}{90}$ from $\frac{19}{30}$ $\frac{3}{14}$ from $\frac{19}{21}$.
10. $\frac{1}{3}$ from 2 $\frac{19}{24}$ from 3 $\frac{4}{7}$ from 5.

EXERCISE CXXXII.

Simplify:—

1. $\frac{1}{2}-\frac{1}{3}$ $\frac{1}{4}-\frac{1}{5}$ $\frac{1}{7}-\frac{1}{8}$.
2. $\frac{2}{7}-\frac{2}{9}$ $\frac{3}{11}-\frac{3}{13}$ $\frac{5}{8}-\frac{5}{9}$.
3. $\frac{5}{6}-\frac{5}{9}$ $\frac{7}{12}-\frac{7}{15}$ $\frac{11}{18}-\frac{11}{24}$.
4. $\frac{7}{15}-\frac{7}{25}$ $\frac{13}{20}-\frac{13}{40}$ $\frac{21}{25}-\frac{21}{45}$.
5. $\frac{5}{21}-\frac{3}{28}$ $\frac{19}{52}-\frac{7}{39}$ $\frac{21}{64}-\frac{7}{48}$.

Find the difference between:—

6. $\frac{5}{12}$ and $\frac{5}{18}$ $\frac{5}{13}$ and $\frac{5}{11}$ $\frac{7}{9}$ and $\frac{7}{11}$.
7. $\frac{13}{16}$ and $\frac{13}{15}$ $\frac{9}{14}$ and $\frac{9}{16}$ $\frac{21}{25}$ and $\frac{21}{23}$.
8. $\frac{5}{14}$ and $\frac{11}{18}$ $\frac{5}{121}$ and $\frac{1}{33}$ $\frac{7}{48}$ and $\frac{23}{60}$.
9. $\frac{13}{99}$ and $\frac{17}{121}$ $\frac{80}{99}$ and $\frac{60}{77}$ $\frac{17}{84}$ and $\frac{19}{126}$.
10. $\frac{7}{15}$ and $\frac{2}{125}$ $\frac{17}{75}$ and $\frac{19}{90}$ $\frac{53}{144}$ and $\frac{47}{84}$.

EXERCISE CXXXIII.

1. Henry had $\frac{3}{4}$ of a dollar and spent $\frac{2}{5}$ of a dollar. How much had he left?

2. Of a pole $\frac{1}{5}$ is white, $\frac{3}{7}$ red, and the rest green. What part of it is green?

3. How much must be added to $\frac{17}{25}$ to produce $\frac{39}{40}$?

4. How much does the sum of $\frac{1}{2}$ and $\frac{1}{3}$ exceed the sum of $\frac{1}{4}$ and $\frac{1}{5}$?

5. Subtract the difference between $\frac{5}{28}$ and $\frac{3}{14}$ from the difference between $\frac{7}{25}$ and $\frac{7}{35}$.

6. The sum of two fractions is $\frac{43}{84}$ and one of them is $\frac{17}{56}$. Find the other.

7. Find the sum of the greatest and least of the fractions $\frac{11}{12}$, $\frac{19}{20}$, $\frac{3}{4}$, $\frac{7}{8}$, and subtract this sum from the sum of the other two fractions.

8. A traveller went $\frac{3}{10}$ of his journey on foot, $\frac{2}{15}$ by railroad, and the remainder on horseback. What part of the journey did he go on horseback?

9. Find the difference between the sum of $\frac{1}{4}$ and $\frac{1}{5}$ and the sum of $\frac{2}{15}$ and $\frac{2}{25}$.

10. The sum of three fractions is $\frac{259}{300}$. Two of them are $\frac{7}{25}$ and $\frac{7}{30}$. Find the third.

EXERCISE CXXXIV.

Simplify:—

1.	$5\frac{7}{12}-2\frac{5}{12}$	$8\frac{9}{11}-5\frac{4}{11}$	$7\frac{12}{13}-2\frac{4}{13}$.
2.	$1\frac{3}{4}-1\frac{3}{8}$	$5\frac{1}{2}-4\frac{3}{7}$	$7\frac{5}{9}-7\frac{7}{16}$.
3.	$3\frac{5}{12}-3\frac{5}{16}$	$7\frac{5}{28}-2\frac{5}{35}$	$8\frac{5}{121}-2\frac{1}{33}$.
4.	$6\frac{9}{17}-2\frac{11}{17}$	$8\frac{3}{11}-3\frac{5}{11}$	$7\frac{5}{13}-2\frac{9}{13}$.
5.	$7\frac{3}{24}-4\frac{5}{8}$	$4\frac{5}{27}-1\frac{5}{9}$	$7\frac{25}{36}-5\frac{25}{32}$.
6.	$19-4\frac{5}{7}$	$36-12\frac{4}{11}$	$24-3\frac{13}{15}$.
7.	$6\frac{12}{49}-5\frac{12}{77}$	$4\frac{13}{21}-4\frac{13}{28}$	$21\frac{5}{28}-10\frac{8}{35}$.
8.	$32\frac{11}{20}-5\frac{13}{15}$	$27\frac{5}{12}-6\frac{13}{18}$	$17\frac{17}{24}-7\frac{11}{18}$.
9.	$34\frac{3}{8}-16\frac{8}{9}$	$56\frac{3}{4}-17\frac{13}{15}$	$48\frac{2}{7}-16\frac{5}{6}$.
10.	$41\frac{5}{12}-17\frac{7}{8}$	$16\frac{2}{11}-4\frac{2}{13}$	$26\frac{7}{15}-13\frac{7}{25}$.

EXERCISE CXXXV.

1. From a barrel of vinegar containing $31\frac{1}{2}$ gallons $14\frac{7}{8}$ gallons were drawn. How much was left?

2. From a piece of cloth containing $35\frac{1}{2}$ yards a merchant cut $21\frac{3}{8}$ yards. How much was left?

3. A man started on a journey of $45\frac{2}{3}$ miles, and travelled $28\frac{7}{8}$ miles. How far had he still to travel?

4. The sum of two numbers is $56\frac{1}{4}$, and one of the numbers is $25\frac{5}{8}$. What is the other number?

5. If I have $\$437\frac{1}{4}$, and pay out $\$341\frac{4}{15}$, how much have I left?

6. From a farm containing $164\frac{2}{3}$ acres, $4\frac{19}{20}$ acres were sold. How many acres remained in the farm?

7. John's monthly salary is $\$166\frac{2}{3}$ and his average expenditure is $\$97\frac{11}{12}$. How much does he save each month?

8. What must be taken from $35\frac{1}{2}$ to leave $22\frac{2}{5}$?

9. The sum of two numbers is $26\frac{7}{15}$. One of them is $10\frac{17}{25}$. Find the other number.

10. From a barge load of coal consisting of $540\frac{1}{2}$ tons $375\frac{17}{20}$ tons have been taken. How many tons are still on board the barge?

EXERCISE CXXXVI.

Simplify:—

1. $3\frac{1}{5}+4\frac{1}{9}-6\frac{5}{6}$ $\qquad 8\frac{1}{4}-7\frac{5}{8}+\frac{11}{16}$.
2. $5\frac{7}{8}-2\frac{1}{4}-\frac{1}{2}$ $\qquad 8-\frac{5}{6}+3\frac{2}{9}-1\frac{3}{4}$.
3. $1\frac{3}{11}-\frac{5}{22}-\frac{7}{55}$ $\qquad \frac{29}{30}+5\frac{1}{5}-\frac{37}{18}$.
4. $5\frac{7}{9}+4\frac{7}{18}-4\frac{1}{6}$ $\qquad 15-3\frac{4}{9}-2\frac{1}{6}$.
5. $\frac{20}{21}+4\frac{1}{3}-\frac{5}{7}$ $\qquad 4\frac{17}{21}+1\frac{25}{27}-1\frac{2}{63}$.
6. $7\frac{4}{7}-2\frac{2}{3}+5-7\frac{20}{21}$ $\qquad 50\frac{5}{18}-4\frac{3}{4}-7\frac{4}{9}-3\frac{7}{36}$.
7. $26-5\frac{1}{4}-6\frac{3}{8}-2\frac{1}{2}$ $\qquad 30-\frac{20}{27}-\frac{13}{18}-\frac{7}{9}$.
8. $4\frac{5}{12}-3\frac{6}{7}+5\frac{5}{84}-2\frac{5}{6}$ $\qquad 15\frac{1}{2}-10\frac{1}{4}+7\frac{1}{8}-5\frac{1}{16}$.
9. $3\frac{1}{4}+4\frac{2}{3}-7\frac{5}{12}+9\frac{1}{2}$ $\qquad 14\frac{4}{9}-10\frac{5}{18}-4\frac{1}{6}+11\frac{5}{11}$.
10. $3\frac{7}{20}-1\frac{3}{8}-\frac{19}{40}+7\frac{3}{11}$ $\qquad 8\frac{7}{24}-2\frac{13}{16}+4\frac{1}{3}-8\frac{3}{14}$.

EXERCISE CXXXVII.

1. From 144 lb. of sugar there were taken at one time $17\frac{5}{8}$ lb. and at another $28\frac{7}{12}$ lb. What quantity remains?

2. A cask of wine contained $42\frac{1}{2}$ gal.; of this $13\frac{3}{4}$ gal. were drawn off, and $12\frac{1}{4}$ gal. leaked out. How much remained in the cask?

3. A grocer bought $89\frac{1}{2}$ lb. of tea; of this he sold $13\frac{1}{4}$ lb. to one customer, $9\frac{1}{2}$ lb. to a second, and $12\frac{3}{4}$ lb. to a third. How many pounds had he left?

4. What number must you add to the sum of $126\frac{1}{7}$ and $240\frac{3}{4}$, to make $560\frac{5}{8}$?

5. A man had to walk $97\frac{3}{4}$ mi. He walked $30\frac{3}{4}$ mi. the first day, $33\frac{1}{2}$ mi. the second day, and finished the journey the third day. How far did he walk the third day?

6. A drover bought 4 cows for $\$168\frac{1}{4}$, and after paying $\$34\frac{1}{10}$ for pasturage, he sold them for $\$203\frac{1}{2}$. Did he gain or lose, and how much?

7. James had $\$12\frac{3}{5}$, and Jane as much, lacking $\$1\frac{13}{15}$. How much money had they together?

8. Bought a quantity of coal for $\$140\frac{3}{8}$, and of lumber for $\$456\frac{2}{3}$. Sold the coal for $\$175\frac{1}{3}$, and the lumber for $\$516\frac{3}{16}$. How much was my whole gain?

9. A merchant had 3 pieces of cloth, containing, respectively, $19\frac{3}{4}$ yd., $36\frac{1}{3}$ yd. and $33\frac{5}{8}$ yd. After selling several yards from each piece, he found he had left altogether $71\frac{3}{8}$ yd. How many yards had he sold?

10. A merchant sold a customer $22\frac{1}{2}$ yd. of silk, $3\frac{1}{4}$ yd. of paper muslin, $1\frac{1}{8}$ yd. of silesia, $5\frac{3}{4}$ yd. of cambric, and $5\frac{1}{3}$ yd. of ruffling. How many yards were sold?

V. MULTIPLICATION AND DIVISION OF FRACTIONS.

EXERCISE CXXXVIII.

Multiply:—

1. $\frac{1}{2}$ by 3 $\frac{2}{3}$ by 4 $\frac{1}{5}$ by 6.
2. $\frac{7}{11}$ by 5 $\frac{4}{9}$ by 7 $\frac{5}{7}$ by 6.
3. $\$\frac{5}{36}$ by 9 $\$\frac{13}{18}$ by 6 $\$\frac{9}{40}$ by 8.
4. $\frac{5}{12}$ by 36 $\frac{4}{13}$ by 26 $\frac{7}{8}$ by 24.
5. $\frac{3}{16}$ by 32 $\frac{7}{12}$ by 12 $\frac{3}{4}$ by 16.
6. $\frac{2}{3}$ by 24 $\frac{17}{20}$ by 10 $\frac{5}{16}$ by 12.
7. $\frac{5}{11}$ by 22 $\frac{5}{7}$ by 21 $\frac{5}{6}$ by 36.
8. $\frac{5}{9}$ by 27 $\frac{5}{21}$ by 35 $\frac{7}{9}$ by 27.
9. $\frac{3}{14}$ by 21 $\frac{7}{15}$ by 25 $\frac{13}{20}$ by 15.
10. $1\frac{3}{20}$ by 20 $4\frac{6}{7}$ by 14 $3\frac{7}{8}$ by 24.

EXERCISE CXXXIX.

Divide:—

1. $\frac{8}{9}$ by 2 $\frac{16}{25}$ by 4 $\frac{21}{47}$ by 3.
2. $\frac{16}{23}$ by 8 $\frac{42}{47}$ by 7 $\frac{96}{101}$ by 12.
3. $6\frac{3}{4}$ by 3 $20\frac{12}{17}$ by 4 $28\frac{14}{19}$ by 7.
4. $34\frac{85}{86}$ by 17 $27\frac{18}{23}$ by 9 $54\frac{24}{25}$ by 6.
5. $6\frac{3}{4}$ by 9 $4\frac{2}{7}$ by 10 $15\frac{1}{3}$ by 23.

Divide:—

6.	$2\frac{6}{7}$ by 5	$6\frac{3}{4}$ by 6	$10\frac{1}{2}$ by 5.
7.	$\frac{1}{2}$ by 3	$\frac{2}{3}$ by 5	$\frac{3}{5}$ by 4.
8.	$\frac{5}{7}$ by 9	$\frac{7}{11}$ by 6	$\frac{8}{13}$ by 5.
9.	$1\frac{1}{2}$ by 7	$7\frac{1}{8}$ by 9	$5\frac{11}{13}$ by 9.
10.	$71\frac{1}{4}$ by 8	$84\frac{2}{7}$ by 12	$36\frac{3}{11}$ by 7.

EXERCISE CXL.

Multiply:—

1.	6 by $\frac{2}{3}$	12 by $\frac{3}{4}$	20 by $\frac{2}{5}$.
2.	$\frac{2}{3}$ by $\frac{4}{5}$	$\frac{3}{5}$ by $\frac{3}{4}$	$\frac{4}{7}$ by $\frac{3}{5}$.
3.	$\frac{5}{6}$ by $\frac{5}{7}$	$\frac{4}{5}$ by $\frac{3}{7}$	$\frac{7}{8}$ by $\frac{3}{4}$.
4.	$\frac{5}{9}$ by $\frac{4}{7}$	$\frac{7}{13}$ by $\frac{4}{11}$	$\frac{8}{9}$ by $\frac{5}{7}$.
5.	$\frac{1}{5}$ by $\frac{15}{19}$	$\frac{2}{3}$ by $\frac{6}{7}$	$\frac{3}{5}$ by $\frac{15}{2}$.
6.	$\frac{2}{5}$ by $\frac{15}{7}$	$\frac{15}{2}$ by $\frac{8}{9}$	$\frac{8}{3}$ by $\frac{15}{7}$.
7.	$\frac{5}{8}$ by $\frac{3}{25}$	$\frac{25}{26}$ by $\frac{39}{50}$	$\frac{7}{8}$ by $\frac{15}{28}$.
8.	$\frac{36}{35}$ by $\frac{7}{8}$	$\frac{49}{50}$ by $\frac{15}{14}$	$\frac{121}{144}$ by $\frac{6}{11}$.
9.	$\frac{21}{32}$ by $\frac{4}{7}$	$\frac{45}{47}$ by $\frac{94}{105}$	$\frac{25}{36}$ by $\frac{24}{35}$.
10.	$\frac{19}{21}$ by $\frac{35}{38}$	$\frac{100}{103}$ by $\frac{47}{50}$	$\frac{15}{2}$ by $\frac{14}{3}$.

EXERCISE CXLI.

Simplify:—

1.	$4\frac{1}{2} \times 4\frac{1}{2}$	$5\frac{1}{4} \times 5\frac{3}{4}$	$7\frac{1}{8} \times 7\frac{7}{8}$.
2.	$5\frac{2}{3} \times 5\frac{1}{3}$	$6\frac{2}{7} \times 6\frac{5}{7}$	$8\frac{4}{7} \times 8\frac{3}{7}$
3.	$6\frac{4}{9} \times 6\frac{5}{9}$	$7\frac{2}{5} \times 7\frac{3}{5}$	$12\frac{5}{8} \times 12\frac{3}{8}$.
4.	$\frac{1}{2} \times \frac{2}{3} \times \frac{3}{4}$	$\frac{4}{5} \times \frac{5}{6} \times \frac{12}{13}$	$\frac{2}{3} \times \frac{3}{5} \times \frac{10}{11}$.
5.	$1\frac{1}{2} \times 2\frac{2}{3} \times 3\frac{3}{4}$	$3\frac{1}{2} \times \frac{7}{8} \times 5\frac{1}{3}$	$3\frac{1}{3} \times 4\frac{1}{5} \times \frac{7}{10}$.
6.	$2\frac{1}{8} \times \frac{50}{51} \times \frac{3}{5}$	$5\frac{1}{2} \times \frac{7}{11} \times 3\frac{1}{7}$	$8\frac{1}{4} \times \frac{5}{11} \times 5\frac{1}{3}$.
7.	$1\frac{1}{3} \times 7\frac{1}{2} \times \frac{3}{25}$	$2\frac{2}{3} \times 4\frac{7}{8} \times 15$	$3 \times 7\frac{1}{2} \times \frac{11}{15}$.
8.	$2\frac{1}{3} \times 3\frac{1}{9} \times 4\frac{2}{7}$	$3\frac{1}{8} \times \frac{4}{5} \times \frac{10}{11}$	$1\frac{5}{11} \times 1\frac{1}{32} \times \frac{2}{3}$.
9.	\$$3\frac{1}{4} \times \frac{7}{39}$	\$$3\frac{1}{5} \times \frac{5}{32}$	925 mi. $\times \frac{3}{5}$.
10.	\$$37\frac{1}{5} \times 15$	140 oz. $\times 2\frac{11}{35}$	$2\frac{1}{4}$ hr. $\times 1\frac{1}{3}$.

EXERCISE CXLII.

1. Find the cost of $9\frac{1}{2}$ yards of cloth at \$$4\frac{1}{5}$ a yard.

2. When flour costs \$$6\frac{2}{5}$ a barrel, how much will $26\frac{5}{8}$ barrels cost?

3. Find the cost of $5\frac{3}{4}$ dozen eggs at $12\frac{1}{2}$ cts. a dozen.

4. John walks at the rate of $3\frac{2}{3}$ miles an hour. How far will he go in $2\frac{1}{4}$ hours?

5. A piece of cloth contains $13\frac{1}{2}$ yds. Find the cost of $\frac{2}{7}$ of the piece at \$$3\frac{1}{2}$ per yard.

6. If it takes $1\frac{3}{4}$ bu. of wheat to sow an acre, how many bushels will it take to sow $7\frac{1}{5}$ acres?

7. If a man earns \$$33\frac{1}{3}$ per week, how much will he earn in a year of 52 weeks?

8. If one horse eats $\frac{3}{7}$ bu. of oats in a day, how many bushels will 14 horses eat in 6 days?

9. A man owning $\frac{4}{5}$ of $156\frac{2}{3}$ acres of land, sold $\frac{1}{2}$ of $\frac{3}{4}$ of his share. How many acres did he sell?

10. At \$$9\frac{3}{5}$ per ton, what will be the cost of $\frac{1}{2}$ of $\frac{5}{6}$ of a ton of hay?

EXERCISE CXLIII.

1. A boy spent $\frac{3}{7}$ of his money and had 96 ct. left. How much had he at first?

2. If I buy $\frac{3}{5}$ of an estate for \$18000, what should I give for the whole of the estate?

3. After going $12\frac{3}{4}$ miles I have still $\frac{34}{40}$ of my journey to go. Find the total length of the journey.

4. Seven-ninths of a post is in the mud and water. There are $8\frac{1}{3}$ ft. in the air. How long is the post?

5. A traveller finds that 175 miles is $\frac{5}{11}$ of the distance he has to go. How far is his journey?

6. A man at his death left his wife \$12500, which was $\frac{1}{7}$ of $\frac{5}{6}$ of his estate. What was the value of the estate?

7. If $\frac{1}{7}$ of a certain number is $42\frac{9}{10}$, what will $\frac{3}{5}$ of $1\frac{3}{7}$ of it be?

8. In a battle a general lost $\frac{2}{17}$ of his army. He still had 34500 soldiers left. How many soldiers had he at first?

9. John has read $\frac{7}{15}$ of a certain book. He still has 112 pages to read. How many pages are there in the book?

10. A person dying left $\frac{2}{3}$ of his estate to his wife, $\frac{1}{12}$ of it to his daughter and the remainder to his son. His son received \$16400. What was his estate worth?

EXERCISE CXLIV.

Simplify:—

1.	$\frac{3}{5}\times(1\frac{2}{3}+2\frac{1}{2})$	$7\times(6-2\frac{1}{2})$.
2.	$8\times(3-\frac{3}{4})$	$(3\frac{1}{2}-2\frac{3}{4})\times\frac{7}{8}$.
3.	$(4\frac{1}{4}+2\frac{3}{8})\times2\frac{2}{3}$	$(3\frac{1}{3}+2\frac{1}{2})\times1\frac{1}{5}$.
4.	$(4\frac{3}{7}-2\frac{4}{5})\times2\frac{2}{19}$	$\frac{7}{33}\times(\frac{2}{7}+3\frac{1}{21})$.

Simplify:—

5. $(\frac{1}{3}+\frac{1}{2})$ of $\frac{6}{11}$ $(3\frac{7}{25}-\frac{7}{35})$ of $1\frac{3}{77}$.
6. $(\frac{1}{2}+\frac{1}{3}-\frac{1}{4})\times 12$ $(2\frac{1}{2}+3\frac{1}{3}-4\frac{1}{6})\times 12$.
7. $(\frac{1}{2}-\frac{1}{3}+\frac{1}{4})\times 24$ $12\times(2\frac{1}{2}+4\frac{1}{6}-3\frac{1}{3})$.
8. $\frac{3}{16}$ of $1\frac{1}{8}$ of $\frac{7}{18}\times 32$ $\frac{4}{5}\times\frac{2}{3}$ of $\frac{3}{7}$ of $\frac{7}{16}$.
9. $(4\frac{1}{2}-2\frac{1}{3}+5\frac{1}{4})$ of $4\frac{4}{5}$ $(\frac{1}{2}$ of $\frac{7}{8}-\frac{1}{3}$ of $\frac{5}{8})\times 2\frac{2}{11}$.
10. $(\frac{1}{4}$ of $1\frac{1}{3}+2\frac{4}{5}$ of $1\frac{3}{7})$ of $\frac{3}{13}$ $(3\frac{1}{4}-\frac{2}{3}$ of $1\frac{4}{5})$ of $1\frac{1}{19}$.

EXERCISE CXLV.

1. If a train of cars runs $22\frac{1}{2}$ mi. an hour, how far will it run in $8\frac{1}{4}$ hrs.?

2. A merchant bought 500 cords of wood at $\$2\frac{7}{8}$ per cord. He sold $75\frac{3}{4}$ cords at $\$4\frac{1}{3}$ per cord and the rest at \$5. Find his gain.

3. A merchant purchased 150 yards of cloth for \$675, and sold $\frac{2}{3}$ of it at a profit of $\$\frac{5}{8}$ per yard, and the remainder at a loss of $\$\frac{1}{16}$ per yard. How much did he gain?

4. There are $50\frac{1}{2}$ bu. of wheat in a bin. How much remains after sowing a field of $7\frac{4}{17}$ acres at $2\frac{3}{7}$ bu. per acre?

5. A bought 319 acres of land at \$200 per acre; he then sold $250\frac{4}{5}$ acres at \$250 per acre, and the remainder at $\$266\frac{2}{3}$ per acre. How much did he gain?

6. From the sum of $3\frac{1}{2}$ and $2\frac{1}{3}$ take their difference and multiply the remainder by $2\frac{1}{7}$.

7. What number added to $14\frac{13}{15}+\frac{8}{7}+\frac{4}{21}+4\frac{7}{15}+1\frac{29}{35}$ will make 60?

8. Three men own a house worth \$6250; one owns $\frac{3}{10}$, the second $\frac{1}{5}$ of it. What is the value of the share of the third?

9. A grocer bought 100 barrels of flour at $\$6\frac{7}{8}$ per barrel; he sold 49 barrels at $\$7\frac{1}{2}$ per barrel, and the rest at $\$7\frac{1}{8}$ per barrel. How much did he gain?

10. A drover bought 64 sheep at $\$7\frac{3}{4}$ apiece; he then sold 30 of them at $\$6\frac{7}{8}$ apiece, and the remainder at $\$8\frac{7}{8}$ apiece. Did he gain or lose, and how much?

EXERCISE CXLVI.

Divide:—

1. 10 by $\frac{5}{7}$ 6 by $\frac{3}{8}$ 12 by $\frac{4}{5}$.
2. 20 by $\frac{5}{9}$ 25 by $\frac{5}{11}$ 36 by $\frac{9}{11}$.
3. 5 by $\frac{4}{7}$ 8 by $\frac{5}{9}$ 9 by $\frac{4}{11}$.
4. 12 by $\frac{7}{10}$ 25 by $\frac{4}{5}$ 27 by $\frac{7}{8}$.
5. 16 by $3\frac{1}{2}$ 25 by $4\frac{2}{3}$ 36 by $5\frac{3}{4}$.

Divide:—

6. 42 by $6\frac{1}{3}$ 45 by $5\frac{3}{4}$ 74 by $6\frac{1}{4}$.

7. 20 by $3\frac{3}{5}$ 25 by $6\frac{1}{4}$ 42 by $5\frac{3}{5}$.

8. $\frac{3}{4}$ by $\frac{5}{7}$ $\frac{4}{7}$ by $\frac{5}{9}$ $\frac{5}{9}$ by $\frac{4}{7}$.

9. $\frac{8}{9}$ by $\frac{3}{4}$ $\frac{3}{5}$ by $\frac{4}{15}$ $\frac{12}{17}$ by $\frac{15}{34}$.

10. $3\frac{1}{4}$ by $1\frac{1}{12}$ $2\frac{2}{9}$ by $4\frac{4}{9}$ $5\frac{7}{8}$ by $5\frac{2}{9}$.

EXERCISE CXLVII.

Simplify:—

1. $7\frac{1}{7} \div 4\frac{2}{7}$ $\frac{8}{25} \div \frac{14}{15}$ $\frac{7}{8} \div \frac{3}{4}$.

2. $\frac{9}{10} \div \frac{4}{5}$ $\frac{27}{52} \div \frac{36}{65}$ $\frac{14}{25} \div 1\frac{13}{15}$.

3. $\frac{64}{99} \div \frac{48}{77}$ $\frac{45}{112} \div \frac{15}{56}$ $\frac{105}{144} \div \frac{245}{432}$.

4. $1\frac{4}{5} \div 4\frac{1}{2}$ $8\frac{1}{9} \div 12\frac{1}{6}$ $2\frac{3}{7} \div 3\frac{2}{5}$,

5. $11\frac{1}{11} \div 12\frac{1}{5}$ $3\frac{1}{7} \div 2\frac{1}{5}$ $9\frac{1}{10} \div 30\frac{1}{3}$.

6. $33\frac{1}{3} \div 10\frac{10}{11}$ $1\frac{14}{91} \div \frac{35}{52}$ $5\frac{1}{2} \div 5\frac{2}{5}$.

7. $6\frac{1}{4} \div 2\frac{1}{2}$ $7\frac{1}{2} \div 1\frac{1}{4}$ $18\frac{2}{3} \div 2\frac{1}{3}$.

8. $12\frac{1}{4} \div 3\frac{1}{2}$ $4\frac{6}{11} \div 5\frac{5}{9}$ $8\frac{6}{7} \div 2\frac{23}{35}$.

9. $7\frac{2}{3} \div 4\frac{4}{9}$ $5\frac{3}{8} \div 7\frac{1}{6}$ $17\frac{1}{5} \div 8\frac{3}{5}$.

10. $18 \div 2\frac{1}{3}$ $12\frac{2}{11} \div 8\frac{3}{8}$ $50\frac{1}{4} \div 9\frac{4}{7}$.

EXERCISE CXLVIII.

1. At \$$\frac{4}{5}$ per yard, how many yards of cloth can be bought for \$30?

2. A man rode $37\frac{4}{5}$ miles in $4\frac{1}{2}$ hours. How far did he ride in one hour?

3. A farmer sold $25\frac{3}{5}$ acres of land for \$672. What was the price per acre?

4. A vessel sails 464 miles in $26\frac{2}{3}$ hours. Find its rate per hour.

5. A miller has $27\frac{1}{2}$ bushels of meal which he wishes to put into bags, each bag to contain $2\frac{3}{4}$ bushels. How many bags will be required?

6. If $3\frac{1}{2}$ pounds of beef cost $43\frac{3}{4}$ cents, what is the price of a pound?

7. If a man travels at the rate of $27\frac{3}{8}$ miles an hour, how long will it take him to travel $784\frac{3}{4}$ miles?

8. By what number must $16\frac{11}{12}$ be multiplied to produce $148\frac{3}{4}$?

9. A farmer sowed $478\frac{1}{2}$ bushels of grain on his farm. If he sowed $2\frac{1}{5}$ bushels per acre, how many acres did he sow?

10. A Manitoba farmer thrashed 10127 bushels of wheat. This was an average yield of $27\frac{1}{3}$ bushels per acre. How many acres had he in wheat?

11. If the cost of carrying $2575\frac{1}{2}$ bushels of wheat from Winnipeg to Montreal is \$394.91, find the rate charged per bushel.

12. If a man can do a piece of work in 18 days by working $14\frac{2}{3}$ hours per day, in how many days can he do the same work, if he works $8\frac{1}{4}$ hours each day?

13. When $35\frac{3}{4}$ bushels of potatoes cost \$28.60, how much should be paid for $4\frac{1}{2}$ bushels?

14. Find a number which divided by $3\frac{1}{3}$, the quotient increased by $1\frac{1}{2}$, and the sum multiplied by $7\frac{1}{5}$, the product is 54.

EXERCISE CXLIX.

Simplify:—

1. $(5\frac{1}{2}+3\frac{1}{3})\div 1\frac{1}{6}$ $(8\frac{2}{3}-3\frac{1}{3})\div 1\frac{1}{3}$.
2. $(8\frac{1}{3}-3\frac{2}{3})\div 1\frac{1}{3}$ $4\frac{1}{2}\div(3\frac{1}{2}-2\frac{1}{4})$.
3. $7\frac{1}{7}\div(5\frac{1}{14}-2\frac{1}{7})$ $20\div(5\frac{5}{6}-4\frac{1}{6})$.
4. $(3-\frac{1}{5})\div(3+\frac{1}{5})$ $(4\frac{1}{2}-2\frac{3}{4})\div(4\frac{1}{2}+2\frac{3}{4})$.
5. $(5\frac{1}{3}+4\frac{1}{6})\div(5\frac{1}{3}-4\frac{1}{6})$ $(21\frac{1}{5}-18\frac{7}{10})\div(21\frac{1}{5}+18\frac{7}{10})$.
6. $(\frac{1}{2}-\frac{1}{3}+\frac{1}{4})\div(\frac{1}{2}+\frac{1}{3}-\frac{1}{4})$ $3\frac{3}{7}\div 5\frac{5}{7}$ of $\frac{7}{32}$.
7. $20\frac{1}{4}\times 3\frac{1}{9}$ of $\frac{1}{28}+2\frac{1}{4}$ $(2\frac{1}{5}\times\frac{13}{23})\div(3\frac{1}{4}\times 5\frac{1}{2})$.
8. $(8\frac{1}{4}\times 3\frac{3}{11}\times 2\frac{3}{4})\div 3\frac{1}{7}$ $(2\frac{1}{2}+3\frac{1}{3})\times 12\div 4\frac{3}{8}$.
9. $\frac{2}{3}$ of $\frac{3}{7}$ of $\frac{7}{8}\div 4\frac{1}{2}$ of $3\frac{1}{3}$ $(4\frac{1}{2}-3\frac{3}{4})\times 8\frac{1}{3}\div 100$.
10. $7\frac{1}{2}\div(4\frac{1}{4}\div 3\frac{3}{4}\div 5\frac{1}{2})$ $7\frac{1}{2}\div 4\frac{1}{4}\div 3\frac{3}{4}\div 5\frac{1}{2}$.

EXERCISE CL.

Simplify:—

1. $\frac{1}{2}\times\frac{1}{3}\div\frac{1}{4}\times\frac{1}{5}$ $\frac{1}{2}$ of $\frac{1}{3}\div\frac{1}{4}$ of $\frac{1}{5}$.
2. $\frac{1}{2}\times\frac{1}{3}\div\frac{1}{4}\div\frac{1}{5}$ $\frac{1}{2}\div\frac{1}{3}\div\frac{1}{4}\div\frac{1}{5}$.
3. $5\frac{1}{7}$ of $8\frac{3}{4}\times 1\frac{1}{5}$ $5\frac{1}{7}\times 8\frac{3}{4}\div 2\frac{1}{4}\times 3\frac{1}{3}$.
4. $5\frac{1}{7}$ of $8\frac{3}{4}\div 2\frac{1}{4}$ of $3\frac{1}{3}$ $7\frac{1}{5}\div 6\frac{3}{10}-6\frac{3}{10}\div 7\frac{1}{5}$.
5. $\frac{1}{2}+\frac{1}{4}$ of $\frac{4}{5}-\frac{5}{8}$ of $\frac{8}{9}$ $\frac{1}{2}+\frac{1}{4}\div\frac{4}{5}-\frac{5}{8}\div\frac{8}{9}$.
6. $8\frac{4}{9}\div 16\frac{8}{9}+\frac{1}{2}$ of $\frac{4}{5}$ $\frac{3}{4}$ of $\frac{16}{21}$ of $9\frac{3}{4}-\frac{7}{8}$ of $3\frac{3}{7}$.
7. $\frac{2}{7}$ of $\frac{21}{38}\times\frac{5}{8}$ of $1\frac{31}{45}$ $3\frac{2}{3}\div\frac{1}{2}$ of $1\frac{3}{8}$.
8. $3\frac{2}{3}\div\frac{1}{2}\times 1\frac{3}{8}$ $12\frac{3}{4}-8\frac{4}{5}$ of $1\frac{4}{11}$.
9. $(12\frac{3}{4}-8\frac{4}{5})$ of $1\frac{4}{11}$ $12\frac{3}{4}-8\frac{4}{5}\times 1\frac{4}{11}$.
10. $\frac{5}{12}\div 1\frac{7}{9}\times 2\frac{2}{11}$ $\frac{5}{12}\div 1\frac{7}{9}$ of $2\frac{2}{11}$.

VI. COMPLEX FRACTIONS.

EXERCISE CLI.

Simplify:—

1. $\dfrac{5}{\frac{6}{7}}$ $\qquad$ $\dfrac{\frac{3}{4}}{6}$.

2. $\dfrac{\frac{8}{9}}{\frac{2}{3}}$ $\qquad$ $\dfrac{\frac{2}{3}}{\frac{4}{9}}$.

3. $\dfrac{2\frac{1}{3}}{4\frac{1}{3}}$ $\qquad$ $\dfrac{5\frac{1}{2}}{3\frac{2}{3}}$.

4. $\dfrac{\frac{2}{3}+\frac{1}{6}}{\frac{3}{4}+\frac{1}{8}}$ $\qquad$ $\dfrac{\frac{11}{12}-\frac{3}{8}}{\frac{11}{12}+\frac{3}{8}}$.

5. $\dfrac{4\frac{1}{4}-3\frac{1}{3}}{4\frac{1}{4}+3\frac{1}{3}}$ $\qquad$ $\dfrac{7\frac{1}{2}-5\frac{1}{4}}{7\frac{1}{2}+5\frac{1}{4}}$.

6. $\dfrac{3\frac{1}{4}+4\frac{1}{3}}{6\frac{1}{2}+1\frac{1}{12}}$ $\qquad$ $\dfrac{3\frac{5}{8}-1\frac{7}{8}}{2\frac{3}{4}-\frac{5}{8}}$.

7. $\dfrac{1\frac{3}{4} \text{ of } 1\frac{1}{7}}{1\frac{2}{3} \text{ of } \frac{6}{11}}$ $\qquad$ $\dfrac{7\frac{1}{2}-2\frac{1}{6}}{\frac{3}{7} \text{ of } 3\frac{1}{2}}$.

8. $\dfrac{2\frac{1}{5} \text{ of } 2\frac{1}{2}}{\frac{3}{14} \text{ of } 3\frac{2}{3}}$ $\qquad$ $\dfrac{2\frac{2}{3} \text{ of } 1\frac{1}{4}}{5\frac{1}{3} \text{ of } 3\frac{3}{4}}$.

9. $\dfrac{1\frac{1}{2}}{1\frac{1}{6} \text{ of } \frac{5}{21} \text{ of } 3\frac{3}{5}}$ $\qquad$ $\dfrac{16}{\frac{7}{15} \text{ of } 2\frac{8}{11} \text{ of } \frac{11}{35}}$.

10. $\dfrac{(2-1\frac{1}{5})\times 2\frac{1}{2}}{\frac{4}{5} \text{ of } 7\frac{1}{2}}$ $\qquad$ $\dfrac{4\frac{1}{2} \text{ of } 5\frac{1}{4}+2\frac{3}{8}}{4\frac{1}{2} \text{ of } 5\frac{1}{4}-10\frac{5}{8}}$.

EXERCISE CLII.

Simplify:—

1. $(32\frac{1}{8}+7\frac{1}{4})\div\frac{3}{7} \text{ of } \frac{7}{11}$.
2. $(5\frac{1}{3}+3\frac{3}{7})\div(9\frac{5}{7}-5\frac{1}{3})$.
3. $(\frac{1}{27}+\frac{1}{5} \text{ of } \frac{2}{3}\times\frac{4}{5})\div(\frac{4}{25}-\frac{1}{3} \text{ of } \frac{2}{5}+\frac{1}{9})$.
4. $\frac{7}{15}\div(\frac{3}{20} \text{ of } \frac{11}{18})\times\frac{19}{30}\div1\frac{1}{6}\times\frac{11}{76}$.
5. $\frac{3}{4} \text{ of } 9\frac{3}{5}+3\frac{3}{8}\div8\frac{1}{10}-\frac{7}{60}$.
6. $3\frac{1}{5}-2\frac{1}{3}\times4\frac{1}{5}\div4\frac{1}{12}+3\frac{9}{10}$.

7. $1\frac{1}{2}+2\frac{2}{3}\times3\frac{3}{4}+1\frac{1}{5}\div1\frac{1}{6}\times3\frac{8}{9}$.

8. $\dfrac{6\frac{1}{4}+5\frac{1}{2}}{6\frac{1}{4}-5\frac{1}{2}}+\dfrac{6\frac{1}{4}\times5\frac{1}{2}}{6\frac{1}{4}\div5\frac{1}{2}}-\dfrac{7\frac{1}{2}}{3}$.

9. $\left(\dfrac{\frac{1}{3}+\frac{3}{10}}{6\frac{1}{3}}+\dfrac{5\frac{5}{7}}{4\frac{4}{9}}\right)\div11\times\dfrac{15\frac{2}{5}}{8\frac{1}{12}}$.

10. $\dfrac{2\frac{1}{2}-\frac{1}{3}\text{ of }1\frac{1}{5}+\frac{4}{5}}{\frac{3}{5}+\frac{1}{3}\text{ of }\frac{5}{8}\div\frac{4}{5}\times\frac{12}{25}}$.

EXERCISE CLIII.

1. What must be added to $\frac{3}{4}+\frac{5}{6}+7\frac{1}{2}$ to make 10?

2. Subtract the sum of $4\frac{2}{3}$ and $3\frac{1}{8}$ from the difference between $15\frac{5}{8}$ and $3\frac{5}{6}$.

3. Multiply $3\frac{1}{3}+5\frac{1}{7}$ by $4\frac{1}{5}$ of $1\frac{1}{2}$ and divide the product by $8\frac{7}{16}$.

4. By how much does the sum of $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}$ exceed the sum of $\frac{1}{7}+\frac{1}{8}+\frac{1}{14}+\frac{9}{56}$?

5. The sum of $\frac{2}{3}$ of $\frac{3}{4}\times2$ and $\frac{2}{5}$ of $\frac{5}{6}\times4\frac{1}{2}$ of $\frac{2}{9}$ is equal to how many times their difference?

6. The smaller of two numbers is $\dfrac{54\frac{3}{5}}{\frac{2}{5}\text{ of }4\frac{1}{3}}$ and their difference is $\dfrac{1\frac{3}{4}}{\frac{1}{2}}$. Find the larger number.

7. What number divided by $4\frac{3}{5}-\frac{1}{4}$ of $3\frac{1}{10}+\frac{7}{40}$ will make the quotient $2\frac{2}{3}$?

8. The product is $12\frac{1}{3}$; the multiplier is $8\frac{2}{9}$. Find the multiplicand.

9. Find the sum, the difference, and the product, of $\frac{5}{12}$ and $\frac{17}{18}$; also find their quotient, making the greater fraction the dividend.

10. What number multiplied by $\frac{2}{9}$ of $\frac{5}{8}\times3\frac{2}{7}$, will produce $\frac{23}{84}$?

VII. G.C.M. AND L.C.M. OF FRACTIONS.

EXERCISE CLIV.

1. Find the G.C.M. and the L.C.M. of $\frac{5}{23}$, $\frac{10}{23}$ and $\frac{15}{23}$.

2. What is the G.C.M. and the L.C.M. of $\frac{7}{9}$, $\frac{14}{27}$ and $\frac{28}{45}$?

3. Find the G.C.M. and the L.C.M. of 4, $2\frac{2}{9}$ and $2\frac{2}{5}$.

4. What is the length of the longest measure that can be exactly contained in each of the two distances, $18\frac{2}{5}$ feet and $57\frac{1}{2}$ feet?

5. What are the longest sections of wire fence, of equal length, with which I can enclose a triangular plot whose sides are respectively $22\frac{2}{9}$ feet, $33\frac{1}{3}$ feet, and 50 feet? How many sections are required to enclose the field?

6. How many times does the L.C.M. of $3\frac{1}{2}$, $4\frac{3}{8}$ and $5\frac{1}{4}$ contain the G.C.M. of these numbers?

7. What is the smallest sum of money with which I could purchase a number of sheep at $\$2\frac{1}{4}$ each, a number of calves at $\$4\frac{1}{2}$ each, or a number of yearlings at $\$9\frac{3}{8}$ each? How many of each could I purchase with this money?

8. A farmer has $33\frac{3}{4}$ bushels of corn, $67\frac{1}{2}$ bushels of rye, $70\frac{7}{8}$ bushels of wheat. He wishes to put this grain, without mixing, into the smallest number of bags, each of which shall contain the same quantity. Required the quantity each bag will contain and the number of bags.

9. A merchant has three kinds of wine, of the first $134\frac{3}{4}$ gallons, of the second $128\frac{1}{3}$ gallons, of the third $115\frac{1}{2}$ gallons; he wishes to ship the same in full casks of equal size; what is the least number of casks he can use without mixing the different kinds of wine?

10. A, B, and C start at the same place and travel round an island, A making the circuit in $\frac{2}{3}$ of a day. B in $\frac{4}{9}$ of a day, and C in $\frac{5}{6}$ of a day; in how many days will they meet at the starting place, and how many times will each have gone round the island?

VIII. DENOMINATE FRACTIONS.

A Denominate Fraction is one in which the primary unit of the fraction is a denominate number, as $\frac{3}{4}$ oz., $\frac{4}{5}$ mi., $\frac{7}{8}$ gal.

EXERCISE CLV.

Reduce each of the following to lower denominations:—

1.	£$\frac{4}{5}$	$\frac{7}{24}$s.	$\frac{3}{8}$s.
2.	$\$\frac{7}{8}$	$\$\frac{4}{5}$	$\$\frac{3}{4}$.
3.	$\frac{7}{8}$t.	$\frac{3}{40}$ cwt.	$\frac{7}{8}$ lb.
4.	$\frac{2}{3}$ mi.	$\frac{5}{9}$ rd.	$\frac{5}{6}$ yd.
5.	$\frac{4}{5}$ A.	$\frac{8}{11}$ sq. rd.	$\frac{5}{16}$ sq. yd.
6.	$\frac{3}{4}$ cd.	$\frac{5}{12}$ cu. yd.	$\frac{7}{24}$ cu. ft.
7.	$\frac{5}{8}$ bu.	$\frac{2}{3}$ pk.	$\frac{3}{4}$ gal.
8.	$\frac{7}{8}$ gal.	$\frac{3}{4}$ qt.	$\frac{4}{5}$ gal.
9.	$\frac{7}{10}$ wk.	$\frac{7}{24}$ da.	$\frac{5}{12}$ hr.
10.	$\frac{2}{3}$°	$\frac{4}{5}$ C.	$\frac{5}{18}$°.

EXERCISE CLVI.

Reduce the following:—

1. 7 mi. 5 rd. 1 yd. to inches; 2 mi. 2 ft. to inches.
2. 7456 ft. to miles, etc.; 2745 yd. to miles, etc.
3. $3\frac{3}{4}$ mi. to inches; $7\frac{7}{8}$ rd. to inches.
4. 5 A. 7 sq. rd. to sq. inches; 98 sq. rd. 14 sq. yd. to sq. inches.
5. 57896 sq. ft. to acres, etc.; 100000 sq. ft. to acres, etc.
6. $2\frac{2}{3}$ A. to sq. inches; $3\frac{4}{11}$ sq. rd. to sq. inches.
7. $4\frac{4}{5}$ t. to pounds; $2\frac{3}{8}$ cwt. to ounces.
8. $\frac{5}{11}$ mi. to rd., yd., etc.; $\frac{7}{12}$ A. to sq. rd., sq. yd., etc.
9. 47212 sq. yd. to acres, etc.; 6912000 sq. in. to acres, etc.
10. 1 t. of water to gallons; 7000 gal. of water to tons, etc.

EXERCISE CLVII.

Find the value of

1. $\frac{7}{12}$ of \$140.76; $\frac{4}{7}$ of \$50.40.
2. $\frac{3}{8}$ of £3 7s. 6d.; $\frac{4}{5}$ of £1 8s. 4d.
3. $\frac{2}{3}$ of 5 t. 8 cwt. 6 lb.; $\frac{4}{7}$ of 2 t. 15 cwt. 9 lb.
4. $\frac{5}{6}$ of 3 mi. 45 rd. 3 yd.; $\frac{2}{5}$ of 7 mi. 35 rd. 1 ft.
5. $\frac{3}{7}$ of 4 A. 50 sq. rd. 3 sq. yd.; $\frac{4}{5}$ of 2 A. 100 sq. rd.
6. $\frac{5}{8}$ of 3 cd. 120 cu. ft.; $\frac{5}{6}$ of 12 cd. 72 cu. ft.
7. $\frac{7}{9}$ of 3 bu. 3 pk. 1 gal.; $\frac{4}{5}$ of 2 bu. 2 pk. 5 qt.
8. $\frac{2}{3}$ of 7 gal. 2 qt.; $\frac{5}{6}$ of 15 gal. 3 qt.
9. $\frac{5}{7}$ of 1 da. 8 hr. 40 min.; $\frac{7}{11}$ of 8 hr. 33 min. 20 sec.
10. $\frac{2}{3}$ of 15° 45′ 18″; $\frac{5}{6}$ of 17° 24′ 36″.

EXERCISE CLVIII.

If 1 ft. is the unit, what number expresses 8 ft.?, 12 ft.?, 21 ft.?

If 2 is the unit, what number expresses 8?, 12?, 21?

What part of 8 is 2? Of 12 is 2? Of 21 is 2?

What fraction of 8 is 2? Of 12 is 2? Of 21 is 2?

1. Reduce $\frac{3}{4}$ lb. to the fraction of a cwt.
2. What fraction of a pound is $\frac{2}{3}$d.?
3. What part of a bushel is $\frac{2}{3}$ gal.?
4. Reduce $\frac{2}{5}$ yd. to the fraction of a rod.
5. Reduce $\frac{1}{2}$ in. to the fraction of a rod.
6. What part of a pint is $\frac{3}{320}$ bu.?
7. Reduce $\frac{3}{3200}$ cwt. to the fraction of an ounce.
8. What fraction of \$$9\frac{3}{4}$ is \$$7\frac{1}{2}$?
9. What part of 2 mi. 130 rd. is 1 mi. 30 rd.?
10. What part of a foot is $\frac{7}{110880}$ mi.?

EXERCISE CLIX.

1. What part of a pound Troy wt. is 10 oz. 13 dwt. 8 gr.?
2. What part of £8 is 1¼ s.?
3. What fraction of a mile 74 rd. 5 yd.?
4. What part of 3¼ yards square is 3¼ sq. yd.?
5. What part of 5 weeks is 7 da. 23 h. 20 min.?
6. What fraction of a cubic yard is 7 cu. ft. 864 cu. in.?
7. What part is 26 gal. 2 qt. 1 pt. of 31½ gal.?
8. Reduce 35 rd. 3 yd. 2 in. to the fraction of a mile.
9. What part of a pound Avoirdupois wt. is 1 lb. Troy wt.?
10. Reduce 86 sq. rd. 4 yd. 5 ft. $127\frac{5}{13}$ in. to the fraction of an acre.

EXERCISE CLX.

1. Reduce 5 A. 91 sq. rd. 7 sq. yd. 5 sq. ft. 29 sq. in. to sq. inches.

2. How many pounds Troy weight are equal to 432 lb. Avoirdupois weight?

3. If a pint of milk costs 2½ ct., how many quarts can be bought for $8.45?

4. If a sheet of paper is 13½ in. long and 8⅓ in. wide, how many such sheets will be required to cover an acre?

5. The circumference of a buggy wheel is 7 ft. 4 in. long. How often does it turn in 6 miles?

6. How many paces 2 ft. 8 in. long are there in 3 miles?

7. What is the cost of 12 bbl. of vinegar averaging 41 gal. 3 qt. 1 pt. at 12½ ct. per quart?

8. Find the value of a pile of tanbark 100 ft. long, 39⅕ wide and 18¾ ft. high at $3.20 per cord.

9. A merchant paid $35 for 8 bbl. of chestnuts averaging 2 bu. 3 pk. 2 qt. per bbl. He sold them at 5½ ct. per pint. Find his gain.

10. Find the value of a pile of wood 225 ft. long, 5⅓ ft. high and 6⅔ ft. wide at $4⅘ per cord.

IX. APPLICATIONS OF THE PREVIOUS RULES.

EXERCISE CLXI.

1. If a cubic foot of broken stone weighs 168 lb., find the weight of 5 cd. 63½ cu. ft. of such stone.

2. A pile of wood is 168 ft. long, 6 ft. high and 4 ft. wide. How many cords are there in it?

3. What will a pile of stone 240 ft. long, 8 ft. high and 4 ft. wide cost at $2.50 per cord?

4. What are 3 bu. of strawberries worth at 2 ct. per pint?

5. A gardener sells 495 crates of berries, each containing a bushel, at 2 ct. a pint. How much did he receive for them?

6. In 1896 how many days were there from Jan. 10th to Oct. 3rd, inclusive?

7. How many minutes were there in Jan., Feb. and March, 1899?

8. How many more minutes were there in Feb., 1896, than in Feb., 1897?

9. What is the value of a barrel of syrup containing 29 gal. 3 qt. 1 pt. at 9 ct. a pint?

10. How many poles each 7½ ft. long, placed in a straight line, will reach 2 mi. 280 rd.?

EXERCISE CLXII.

1. Divide 13 cwt. 63 lb. equally among 29 persons.

2. A pint of water weighs 1 lb. 4 oz. How many pints are there in 22 t. 11 cwt. 40 lbs. of water?

3. If 178 cwt. 61 lb. are divided into 53 equal parts, how many ounces are there in each part?

4. How many tons, cwt., etc., are there in one million ounces?

5. How many parcels each weighing 2 lb. 12 oz. can be made from 2 t. 9 cwt. 50 lb. of sugar?

6. Find the cost of 4 t. 19 cwt. 99 lb. of sugar at 5 ct. a pound.

7. How many ounces of iron are required to make 32 iron bars, each weighing 2 lb. 7 oz.?

8. I bought 3 cwt. 19 lb. of tea for $127.60, what did I pay per lb. for it?

9. Out of a box containing 3 cwt. 78 lb. of sugar, how many 2 lb. parcels can be made?

10. A railway truck weighs 5 t. 3 cwt. On it are placed 97 iron bars each weighing 3 cwt. 76 lb. Find the total weight in pounds of the truck and bars?

EXERCISE CLXIII.

1. How many grains in 11 silver medals each weighing 4 oz. 5 dwt. 6 gr.?

2. If 7 silver medals each weighing 10 dwt. 13 gr. are melted and the silver divided equally among 11 persons, how many grains would each have?

3. In 2468 grains of gold dust, how many ounces are there?

4. In a silver box weighing 10 oz. 16 dwt., how many grains are there?

5. How many grains of gold will be required for 12 ornaments each weighing 1 oz. 18 dwt. 12 gr.?

6. Reduce 58376 grains to lbs., oz., etc., Troy.

7. How many forks averaging 2 oz. 9 dwts. each can be made from 5 lb. 1 oz. 5 dwt. of silver.

8. How many lbs. of silver in 270 spoons, each of which weighs 1 oz. 13 dwt. 8 grs.?

9. Express 4040789 grains in lbs. oz. dwt., etc.

10. A pound Troy contains 5760 grains and a pound Avoirdupois 7000 grains. Find how many pounds Troy there are in 94 lb. 8 oz. Avoirdupois.

EXERCISE CLXIV.

1. How many inches are there in a mile?

2. A lake is 112 fathoms in depth; what is its depth in inches?

3. A wheel is 13 ft. 9 in. round. In turning 768 times, how many miles does it pass over?

4. Find the cost of 20 miles of telephone wire at 35 cents a lb. supposing a lb. stretches 80 ft.?

5. Find the cost of 4 miles of barbed wire if 4 feet cost 8c.

6. What will it cost to survey 25 miles of road at 25 cents for every 66 feet?

7. The distance from London to Harrisburg is 61 miles 224 rods. How long will it take to walk that distance at 32 rods per minute?

8. How many inches are there in 5 times 4 mi. 319 rd. 5 yd. 1 ft. 6 in.?

9. How many more inches are there in 3 times 7 mi. 1759 yd. 2 ft. 2 in. than in 4 times 3 mi. 319 rods 5 yd. 6 in.?

10. A boy going to school walks 126720 inches every day. How far will he walk in a school year of 220 days? Answer in miles, etc.

EXERCISE CLXV.

1. At 40 cents a gallon what would be the cost of 5 bbl. syrup, each containing 36 gal.?

2. A man bought a hhd. (63 gals.) of molasses for $18.90 and sold it at 10c. a pint. How much did he gain?

3. I bought a bushel of chestnuts for $4.80. What will be the cost of 13 qts.?

4. A gardener has 13 bu. 2 pk. 1 gal. 2 qt. of strawberries. How many quart baskets will be needed to hold them?

5. If 376 gal. 3 qt. 1 pt. of milk be divided among 9 charities, how many pints will each receive?

6. A man bought 14 bags of beans, each containing 2 bu. 2 pk. for $21, and sold them in boxes of 1 bu. 3 pk. each, so as to neither gain nor lose. Find the price per box.

7. How many loads of apples of 27 bu. 3 pk. each can be bought for $53.28 at 48c. per bushel?

8. What is the value of 324 bags of beans, each containing 2 bu. and 1 pk. at 70c. a bushel?

9. A milkman started with 10 gal. of milk. He sold ½ pt. to each of 52 people and a pint to each of 50 others; how much has he left? Ans. in quarts.

10. Reduce 143 bu. 3 gal. 3 qt. 1 pt. of wheat to pints, and find the value at 1½ cents a pint.

EXERCISE CLXVI.

1. A farmer travels 200 miles in 8 days, how many days will it take him to go 4224000 ft.?

2. A man walked 136 miles in 45 hrs. 20 min., how many feet did he go per minute?

3. How many times is 195 yd. 1 ft. 8 in. contained in 1 mile?

4. A train goes 30 miles an hour, how many feet does it go per second?

5. A rate of 22 yd. in 5 seconds is equal to what rate per hour?

6. A tank has 12000 gal. of water in it. How long will it take to empty it, if 5 pints are emptied in a minute?

7. How many days of 10 hrs. each would it take to count 30,000,000 sovereigns at the rate of 100 per minute?

8. Find the cost of 3975 lb. bran at $1.44 per cwt.

9. A farmer paid a laborer $1.75 a day for the month of August, what should he get if the month began on Wednesday?

10. Find the cost of 40 lb. of ice, delivered three times a week from April 1st to October 6th inclusive, at 60c. per hundred pounds.

EXERCISE CLXVII.

1. Find the difference in the cost of 17 bu. of wheat when sold at 1c. per lb. or 1c. per pint.

2. A pile of 4 foot wood is 64 ft. long. How high should it be to contain 10 cords?

3. How many steps each 2 ft. 6 in. in length will a man take in walking 3⅞ miles?

4. A farm of 111 acres is divided into fields of 7a. 64 sq. rd. How many fields are there?

5. How far can I walk in 10 hr. 45 min. at the rate of a mile in 15 minutes?

6. How many more hours are there in January than in February; 1896?

7. How many paces each 2 ft. 8 in. are there in 2⅓ miles?

8. Reduce 3 weeks 19 hrs. 25 min. 15 sec. to seconds, and 133 weeks 6 days 19 hrs. 5 min. 45 sec. to seconds, and divide the larger quantity by the smaller.

9. The circumference of a wheel is 16 ft. 6 in. long. How often will it turn between London and Hamilton, 76 miles?

10. A coach wheel 10 ft. 9 in. round, turns 12 times in 10 seconds, at what rate per hour is the coach going?

EXERCISE CLXVIII.

1. Find the weight of a dozen and a half silver spoons each weighing 4 oz. 4 dwt. 22 gr.

2. Add together £37 17s. 4½d., £19 12s. 10¼d, £183 19s. 3d. and £52 0s. 11¼d. and take £93 10s. 5d. from the sum.

3. Multiply 3 cwt. 3 lb. 3 oz. by 69 and subtract the result from 11 tons.

4. A bicyclist travelled 50 miles in 3 hrs. 3 min. 20 sec. What was his rate in feet per second?

5. A train travels 95 miles 1100 yd. in 2 hr. and 50 min. How far does it go in 1 minute?

6. If I walk 350 yd. in 2 min. 40 sec. how long will it take me to walk 560 yd.? What distance can I walk in 7 min. 28 sec. at the same rate?

7. How many yards per minute faster is the rate, 42 miles an hour, than the rate 20 yards per second?

8. How many bags of sugar each holding 235 lb. are there in 6 t. 6 cwt. 90 lb?

9. A grocer buys 13 hhd. of sugar weighing 6 t. 8 cwt. 57 lb. How much did each weigh?

10. How many trees will be required to plant 27 a. 91 sq. rd. 22 sq. yd. 2 sq. ft. 36 sq. in., allowing 105 sq. yd. for each tree?

EXERCISE CLXIX.

1. How many more inches are there in 3 yd. 1 ft. 6 in. than in 3 ft. 6 in.

2. Three men can cut 8 ac. 36 sq. rods in a day, how long will it take them to cut 57 ac. 92 sq. rods.

3. How many days from March 13th, 1898, to July 31st, 1899, both inclusive?

4. How many miles will a boy walk to plough 6 acres turning 9 inches of a furrow?

5. A man bought 3 bu. 3 pecks of nuts at 75c. a peck and sold them at 10 cents a quart. How much did he make?

6. A farmer in the North-West had 480 acres of wheat, and the average yield was 27 bus. 3 pks. 6 qts. 1 pt. per acre. What will the whole be worth at 60 ct. per bushel?

7. The price of broadcloth at 10s. 8d. per yd. is £26 12s. How many yards are there of it?

8. A boy bought a bushel of nuts for $1 and sold them at 5 ct. a quart. How much did he gain?

9. If sound travels at 1144 feet per second, how long would it take to travel to the moon, a distance of 240500 miles?

10. If a wheel turns 780 times in going over 1 mi. 1685 yd. What is the length of its circumference?

EXERCISE CLXX.

1. What is the difference in weight between 3 dozen silver table spoons weighing 5 lb. 9 oz. 8 dwt. and as many silver tea spoons weighing 1 lb. 9 oz. 16 dwt. 18 gr.

2. How many times is 391 yd. 4 in. contained in 2 mi.?

3. If a man walk $\frac{1}{4}$ mile in 5 minutes, how many hours will it take him to walk 36 miles at the same rate?

4. Find the number of days between Sept. 23rd and Jan. 11th, one of these days included.

5. A man walks 1 mi. 47 rd. in 20 minutes how long will it take him to walk 123 mi. 276 rd.

6. How many boards each 11 ft. 6 in. long and 10 in. wide will be required for the flooring of a room 23 ft. long and 17 ft. 6 in. wide?

7. How many turns will a wheel 3 yd. 2 ft. 3 in. round make in passing over 198 miles?

8. How many silver spoons weighing 1 oz. 18 dwt. 12 gr. can be made from 23 oz. 2 dwt. of silver?

9. What is the rate per hour of a horse that travels 18 mi. 1620 yd. in 3 hr. 45 min.?

10. Find the cost of 260 lb. of tea at 3s. $3\frac{3}{4}$d. per lb. If 20 lb. of it be spoiled, how much is gained by selling the remainder at 4s. $1\frac{1}{2}$d. per pound?

EXERCISE CLXXI.

1. How much oats will it take to seed 87 acres, using 2 bu. 1 pk. 5 qt. to the acre?

2. A miller ground 7845 bu. of wheat. How many barrels of flour did he obtain, provided each bushel yielded 39 lb. $3\frac{1}{5}$ oz.?

3. A and B together bought a web of silk; A paid for $\frac{5}{12}$ of it and B for the remainder. The difference between their shares is $5\frac{1}{2}$ yd. What is the share of each?

4. If A travels 24 mi. 198 rd. 4 yd. in 6 hr. 30 min., how far will he go in 9 hr. 45 min.?

5. A field 80 rods long contains 15 acres, while another field of the same width contains 9 acres; what is the length of the latter field?

6. A lady bought 15 yd. of velvet $\frac{1}{2}$ yd. wide. How much silk $\frac{7}{8}$ yd. wide must she buy to line it?

7. Mrs. Brown wishes to carpet a room 18 ft. long by 15 ft. 6 in. wide, with Brussels carpet $\frac{5}{8}$ of a yard wide, at $1.25 a yard. How much will it cost her?

8. If $4\frac{7}{9}$ lb. of pepper cost $2.15, what will 30 lb. cost?

9. If $30\frac{4}{15}$ tons of iron cost $1728, what will $7\frac{17}{30}$ tons cost?

10. If $9\frac{11}{12}$ tons of copperas cost $$333\frac{1}{3}$, what quantity of copperas should be received for $500.

EXERCISE CLXXII.

1. If $\frac{3}{10}$ of a barrel of flour costs $2.25, what will a whole barrel cost?

2. If $\frac{7}{11}$ lb. of a drug costs $2.52, what is the value of $\frac{4}{9}$ of a lb.?

3. If $4\frac{3}{8}$ tons of coal cost $28, what will 15 tons cost?

4. When $8 are paid for $1\frac{3}{7}$ yards of broadcloth, how much must be given for $8\frac{3}{4}$ yards?

5. Sold $7\frac{7}{12}$ bushels of apples for $7.28. What should I receive for $19\frac{11}{12}$ bu.?

6. How many yards of muslin, at $62\frac{1}{2}$ ct. per yard, must be given in exchange for 34 bu. of sweet potatoes, at 50c. per bushel?

7 How many pounds of butter at $18\frac{3}{4}$ ct. per pound, should be exchanged for $40\frac{1}{2}$ yd. of calico at $12\frac{1}{2}$ ct. per yard?

8. If a man works $8\frac{1}{2}$ hr. a day, he can finish a piece of work in $12\frac{1}{2}$ days. How many hours per day must he work to complete it in $10\frac{5}{8}$ days?

9. If $\frac{5}{9}$ of a yard of ribbon cost $$\frac{7}{8}$, what will $5\frac{2}{3}$ yd. cost?

10. Paid $$7888\frac{3}{10}$ for $83\frac{9}{16}$ acres of land. What sum did I pay for each acre, and what would be the cost of 7 acres?

EXERCISE CLXXIII.

1. How many parcels each weighing 41 lb. 8 oz. can be made up out of goods weighing 1 ton, and what weight will be remaining?

2. How many pounds of sugar at $6\frac{1}{4}$ cents a pound will pay for 12 dozen eggs at $16\frac{2}{3}$ cents a dozen?

3. If a man can drive $10\frac{4}{5}$ miles in $1\frac{1}{2}$ hours, how far can he drive in $5\frac{5}{6}$ hours?

4. How many yards of cambric $\frac{7}{8}$ yd. wide will it take to line 14 yards of cloth $1\frac{1}{2}$ yd. wide?

5. After selling $\frac{2}{3}$ of his sheep to a drover, and $\frac{1}{3}$ of the remainder to his neighbor, a farmer has 100 left. How many were there in the flock at first?

6. A road to the top of a hill has a rise of $\frac{1}{6}$ of a foot in 10 feet. How many feet is the total elevation of the hill, if the length of the road is 2 miles?

7. From 120 A. of land $32\frac{2}{5}$ A. are sold to one man and $\frac{1}{3}$ of the remainder to another. How many acres are unsold?

8. A grocer buys 30 lb. of tea at 48 ct. a pound, and 50 lb. at 64 ct. a pound, and having mixed them sells 40 lb. of the mixture at 56 ct. per pound. At what price per lb. must he sell the remainder that he may neither gain nor lose?

9. A gentleman gave $\frac{3}{4}$ of his estate to his wife, $\frac{2}{3}$ of the remainder to his oldest son, and $\frac{3}{4}$ of what then remained to his daughter, who received $750; required the whole estate.

10. A man has 4 lots containing $4\frac{7}{8}$ A., $6\frac{33}{40}$ A., $9\frac{3}{4}$ A. and $11\frac{7}{10}$ A. respectively. He wishes to divide each lot into the largest sized building lots possible, each lot to contain the same area. How much land will each building lot contain?

EXERCISE CLXXIV.

1. A wine merchant bought a pipe of wine (126 gal.) and bottled it into an equal number of quart, pint, and half-pint bottles. How many bottles of each size had he?

2. At $6.40 a cord, what is the value of two piles of wood, each 4 ft. wide and $1\frac{1}{3}$ yd. high, but the one $2\frac{1}{8}$ rd. in length, and the other $15\frac{1}{2}$ yd.?

3. From two fields 482 bushels of corn are gathered. The first field yields $\frac{1}{2}$ as much as the second. How many bushels does each field yield?

4. What must be paid for a pile of wood 25 ft. long, $3\frac{1}{5}$ ft. high, and $6\frac{3}{4}$ ft. wide at $\$4\frac{4}{5}$ per cord?

5. If $10\frac{1}{2}$ lb. of milk make a lb. of cheese, find the value at 9 ct. per lb. of the cheese made from 350 tons of milk.

6. A cistern $7\frac{1}{3}$ ft. long and $5\frac{1}{2}$ ft. wide contains $332\frac{3}{4}$ cu. ft. What is its depth? How many gallons of water will it hold?

7. At 12 cents per cubic foot, what will be the cost of a block of stone 9 ft. long, $5\frac{1}{2}$ ft. wide, and 4 ft. thick?

8. A father divided a piece of land among his three sons thus: he gave $12\frac{1}{2}$ acres to the first, $\frac{3}{8}$ of the whole to the second, and to the third as much as to the other two together. How many acres were in the piece of land?

9. A man bequeathed \$37000 to his family. He gave $\frac{1}{4}$ to his wife, $\frac{1}{5}$ to his son, and divided the rest equally among 5 daughters. How much did each daughter receive?

10. A young man lost $\frac{1}{5}$ of his money in betting on races, $\frac{1}{8}$ of the remainder in stock jobbing, $\frac{3}{5}$ of what was left by investing in foreign bonds, and has now \$1750 left. Find the amount of his property at first.

EXERCISE CLXXV.

1. From a tract of land containing 365 A. 90 sq. rd. were sold 110 A. 110 sq. rd., and the remainder was divided equally among 5 persons. Find the share of each.

2. In digging a cellar 24 ft. long and 10 ft. wide, 1860 cu. ft. of earth were removed; how deep is it?

3. If a pile of bark 24 ft. 6 in. long, and 4 ft. 6 in. wide, contains $955\frac{1}{2}$ cu. ft., how high is it?

4. A gentleman sent a silver tray and pitcher, weighing 3 lbs. 9 oz., to a jeweller, and ordered them to be made into tea spoons, each weighing 1 oz. 5 dwt. How many spoons should he receive?

5. A man having a piece of land containing $384\frac{4}{5}$ A., divided it between his two sons, giving to the elder 22 A. 60 sq. rd. more than to the younger. How many acres did he give to each?

6. A and B own a farm; A owns $\frac{7}{12}$ of it and B the remainder. The difference between their shares is 15 A. $68\frac{1}{2}$ sq. rd. How much is B's share?

7. The forward wheels of a wagon are 10 ft. 4 in. in circumference, and the hind wheels $15\frac{1}{2}$ ft. How many more times will the forward wheels revolve than the hind wheels in running from Boston to New York, the distance being 248 miles?

8. What will be the cost of plastering the walls and ceiling of a room 36 ft. long, $26\frac{1}{2}$ ft. wide, and 15 ft. high, at 21 cents a sq. yd., making no deductions?

9. A man has a piece of land $201\frac{2}{3}$ rods long and $41\frac{1}{4}$ rods wide, which he wishes to lay out into square lots of the greatest possible size. How many lots will there be?

10. A gentleman gave $\frac{1}{4}$ of his property to his son James; $\frac{1}{3}$ of it to his son William; $\frac{1}{5}$ of the remainder to his daughter Mary; and the balance to his wife. Mary received \$2243.26 less than James. What was the amount divided, and how much did each receive?

EXERCISE CLXXVI.

1. A can dig a field in 5 days. B can dig it in 4. If both work together, what part of the field will they dig in one day?

2. A can do a piece of work in six days which B can do in 8 days. They work together at it for 2 days. How much of the work remains to be done?

3. A can mow a piece of grass in 4 days, and B can do it in 2 days; how long will it take both working together to do it?

4. A and B together can do a piece of work in 18 days, but with the assistance of C they do it in 12 days. In what time can C do it by himself?

5. A and B together can do a job in 7 days, but it would take A alone 12 days to do it. How long would it take B alone to do it?

6. A and B together can do a piece of work in 20 days. A can do it alone in 36 days. After A has worked 3 days alone, how long would it take B to finish it alone?

7. Three men can do a piece of work in 4 days; the first can do it in 15 days, and the second can do it in 12 days. How long will it take the third to do it?

8. A can do a piece of work in 3 days, B can do it in 4 days, and C can do it in 5 days. How long will it take them to do it together?

9. A can mow a field in 10 days, B in 8 days, and C in 5 days. When working together, how many days will they need?

10. A can build a wall in 8 days, B in 6 days, and C in 5 days. A and B worked together for 1 day, when they were joined by C. How many days will they need to complete the remainder of the work?

11. A and B working together can mow a field in 10 days; A and C can do the same work in 9 days; and B and C in 12 days. In what time can C do the work alone?

12. If 4 men or 20 boys can do a piece of work in 12 hours, in what time can 3 men and 30 boys do the same work?

13. If 5 men, 8 women, or 12 boys can do a piece of work in 20 hours, in what time can 1 man, 2 women and 3 boys do this work?

14. Three men are employed to dig an acre of land. A can dig 40 sq. rd. in 6 days, B can dig 60 sq. rd. in 8 days; and C can dig the whole in 16 days. If all begin to work together, in what time will they dig the acre of land?

15. A can dig a garden in $5\frac{1}{2}$ days; B can dig the same garden in $4\frac{2}{5}$ days. If they begin to dig together in what time can they dig the entire garden?

16. A can do a piece of work in $6\frac{1}{4}$ days; B can do the same work in $7\frac{1}{2}$ days and C can do it in $8\frac{1}{3}$ days. A works alone at the job for 2 days when B begins and the two work together for a day. Then C joins them and they all continue until the work is done. How long does A work?

CHAPTER VII.

DECIMALS.

I. DEFINITIONS, NOTATION AND NUMERATION.

When the number 10000 is divided by 10, the quotient is 1000.

When 1000 is divided by 10, the quotient is 100.

When 100 is divided by 10, the quotient is 10.

When 10 is divided by 10, the quotient is 1.

When 1 is divided by 10, the quotient is $\frac{1}{10}$ and is written .1.

When .1 is divided by 10, the quotient is $\frac{1}{100}$ and is written .01, etc.

Such numbers as .1, .01, .001, .34, 5.7, etc., are called decimals, or decimal fractions.

Decimals, or Decimal Fractions are fractions in which the unit is divided into 10, 100, 1000, etc., equal parts.

A decimal is expressed by writing the numerator of the fraction with a point so placed as to indicate the order or place of the decimal.

This point which separates integers from decimals is called the **Decimal Point.**

When there is a part of the number to the left of the point, this is called the **Integral part,** and that to the right, the **Decimal part,** of the given number.

The following table shows the relation of the various orders or places to the right and left of the unit's place to each other, thus the order tens is first to the left of units, the order tenths is first to the right of units; the order hundreds is second to the left of units, the order hundredths is second to the right of units, etc.

Notation and Numeration Table.

Billions.	Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.	*Decimal Point.*	Tenths.	Hundredths.	Thousandths.	Ten-Thousandths.	Hundred-Thousandths.	Millionths.	Ten-Millionths.	Hundred-Millionths.	Billionths.
10	9	8	7	6	5	4	3	2	1	.	2	3	4	5	6	7	8	9	10
INTEGERS.											DECIMALS.								

EXERCISE CLXXVII.

Read or write in words:—

1.	.9	.45	.75	.08.
2.	.275	.087	.006	.209.
3.	2.06	7.001	10.07	9.207.
4.	.3875	.0562	.0083	.0006.
5.	1.631	1.315	48.007	87.0006.
6.	201.201	78.567	100.001	709.224.
7.	612.612	13.0108	700.625	5.6006.
8.	10000.001	1000.0001	100000.01	1000000.1.
9.	200.2006	2002.006	20020.06	20.02006.
10.	78965.432	789.65432	7896.5432	789654.32.

EXERCISE CLXXVIII.

Write in figures:—

1. Three hundred and twenty-five, and seven tenths.
2. Four hundred and sixty-five, and fourteen hundredths.
3. Ninety-three, and seven hundredths.
4. Two hundred and thirteen thousandths.
5. One thousand, and six ten-thousandths.
6. Thirty-seven, and seventy-two thousandths.
7. Seven hundred and eighteen ten-thousandths.
8. Two hundred and forty thousand, and four hundred and six thousandths.
9. Fifty-six million, and fifty-six millionths.
10. Seventy million, and seven millionths.

II. ADDITION.

EXERCISE CLXXIX.

Add together:—

1.	359.6	7.04	200.	1.01.
	35.964	36.475	36.019	19.009.
	520.	90.007	7.7	178.6.
	43.7	0.689	84.09	6.83.
	.876	367.	785.3677	20.761.
	1.01	7.82	6.005	.84.

2. 18.79, 147.072, 856.709, 185.8761, 397.05784.
3. 3.584, 387.6, 5.894003, .00397, 8.889.
4. 8939, 8.939, 89.39, .8939, .0008939, 893.9.
5. 56.6794, 5.76, .579, 342.1, 34.21, 7000, 9.7646.
6. 47.21, .946, 154.172, .000457, 17.46, 173, .05409.
7. 4.71, 3.967, 17.10845, .04075, 6.154, 99.876.
8. 27.16, 47.148, 9, 9.2387, .00476, .0853, 78.
9. $47.19, $27.15, $364.10, $.75, $4.085, $65.075.
10. $7.009, $7, $871, $.065, $1.005, $21.075, $6.675.

EXERCISE CLXXX.

Simplify:—

1. 64 + .78 + 479.543 + 66.8 + 395.4876.
2. 34.084 + .088 + 96.7854 + 78 + 42.89.
3. 9.3 + .04 + 8.0067 + 778.7 + 47.0393.
4. 365.84 + 19.07 + 17.8 + 78 + 584.3671.
5. 729. + 2.3788 + 35.68 + 7806.7 + .379.
6. 19.7864 + 3987 + .9 + 577.17 + 93.8 + .48.
7. 9.7 + 64.36 + .587 + 97 + .00487 + 54.7.
8. 76.54 + 3896.0484 + 77.3456 + 68 + 78.99.
9. 87.4785 + 78 + .84 + 37.84672 + 18.75.
10. 3698 + 786.4 + 7 + 4.9 + 36.847 + .099.

EXERCISE CLXXXI.

1. A man has in one field 27.9 acres; in another, 45.755 acres; in a third, 135.125; and in a fourth, 73.625. How many acres has he in all?

2. Add together two hundred and nine thousand, and forty-six millionths; ninety-eight thousand two hundred and seven, and fifteen ten-thousandths; fifteen, and eight hundredths; and forty-nine ten-thousandths.

3. What is the sum of the following numbers: twenty-five, and seven millionths; one hundred and forty-five, and six hundred and forty-three thousandths; one hundred and seventy-five, and eighty-nine hundredths; seventeen, and three hundred and forty-eight hundred-thousandths?

4. A merchant bought at one time 23.75 yards of cloth; at another time, 57.375 yards; and at another, 34.6875 yards. How many yards did he buy in all?

5. A farmer sold 2.875 tons of fodder; 8.3125 tons of oats; 5.455 tons of hay, and 7.625 tons of clover. How much did he sell in all?

6. Add the following numbers: fifty-nine, and fifty-nine thousandths; twenty-five thousand, and twenty-five ten-thousandths; five, and five millionths; two hundred and five, and five hundredths.

7. What is the sum of 304 thousandths, 5103 hundred-millionths, 61032 millionths, 413 hundred-thousandths, and 603 ten-thousandths?

8. Jones bought 4 loads of hay, weighing 1.475 tons, 2.085 tons, 1.516 tons, and 1.424 tons, respectively. How many tons are there in all?

9. What is the sum of forty-nine, and one hundred and five ten-thousandths; eighty-nine, and one hundred and seven thousandths; one hundred and twenty-seven millionths; and forty-eight ten-thousandths?

10. What is the sum of three, and eighteen ten-thousandths; one thousand and five, and twenty-three thousand and forty-three millionths; eighty-seven, and one hundred and seven thousandths; forty-nine ten-thousandths; forty-seven thousand, and three hundred and nine hundred-thousandths?

III. SUBTRACTION OF DECIMALS.

EXERCISE CLXXXII.

1. From	7.84	81.01	36.006	76.894
Take	3.67	27.08	21.785	7.397.
2. From	39.3	5.	6.1	41.7
Take	1.6789	1.678	1.99999	21.9767.
3. From	7.6	3.842	.0067	7.
Take	2.847	1.9678	.0009	1.345.

4. From 8, take 2.7689; from 6.5, take 2.378.

5. From .8, take .347; from 63, take 7.9684.

6. From 25, take 12.789; from 17, take .0007.

7. From 100, take .0001; from 10, take .01.

8. From 87.1, take 5.6789; from 1, take .87654.

9. From 74.8, take 37.456; from 5.08, take 1.675.

10. From 385, take .0076; from 1001, take 7.0006.

EXERCISE CLXXXIII.

Simplify:—

1.	7—3.456	15—2.34	17—6.435.
2.	2.5—1.7859	.36—.0897	5.1—.7845.
3.	8.275—5.185	2.0132—1.25	3—.214.
4.	70.5—.0375	6.4—3.876	17—9.0067.
5.	9.008—4.7563	2—.745	1—.0001.
6.	10—.0005	100—99.875	25—3.675.
7.	.75—.075	785—7.85	785—.785.
8.	600—6.66	5—.275	1—.175.
9.	4—3.8765	28—2.8795	3.65—1.19.
10.	100—3.145	5—.5555	7.89646—6.9.

EXERCISE CLXXXIV.

1. From seventy-three, take seventy-three thousandths.

2. From twenty-three hundredths, take three hundred and seven ten-thousandths.

3. From three hundred and sixty-five, take forty-seven ten-thousandths.

4. From seven thousand, and seventeen millionths, take .0004125.

5. From one million, take one millionth.

6. From eighteen thousandths, take five hundred and nineteen millionths.

7. From three million, and one millionth, subtract one tenth.

8. From one thousandth, subtract one millionth.

9. From fifty-three, and ninety thousandths, take ten, and three hundred-thousandths.

10. From seven thousand and seven, subtract seventy-seven, and four thousand and seven hundred-thousandths.

EXERCISE CLXXXV.

Simplify:—

1. 25.000315 — .00045 + .2801 — 16 + 21.001.
2. 8.14 + 38.124 — .9175 — 16.28 + 46.
3. 16.945 — 2.994387 — .06735 — .0007 + .953 + 0.8.
4. 7.654327 — .3793086 + 9.06996 — .00999 + .345.
5. 78 — 16.45 — 32.08 — 11.769 + 24.365 + 7.09.
6. 100 + 1.005 — 41 — 36.008 — 21.07 + 1.225.
7. 84 — 7.69 + 9.089 — 3.425 — .825 — .006.
8. 1.6 + 7.92 + 6.859 — 3.9999 — 2.5554 — .064.
9. 75 — 25.8 + 36.08 — 25.755 + 42.375 — 21.875.
10. .008 + 10.01 — 3.5876 — 2.8497 + 7.854 — 2.345.

EXERCISE CLXXXVI.

1. A farmer owning 957 acres of land sold at one time 225.7 acres; at another, 175.45 acres; and at another, 327.375 acres. How many acres did he still have?

2. A merchant, having $1000, invested it as follows, viz.: $145.75 in calico; $275.56 in shoes; $95.25 in hats; $156.375 in broadcloths, and the remainder in groceries. How much did he invest in groceries?

3. A is to travel 597 miles in 3 days. The first day he travels 196.4 miles, and the second day 201.25 miles. How many miles must he travel the third day?

4. A man received the following sums: $27.40, $68.75, $810.47, $386.59, and $2.20. He paid out the following sums: $78.67, $129.72, $119.46, and $3.88. How much had he left?

5. A man owning 875 acres of land divided it among his four sons as follows: to the first he gave 213.65 acres; to the second, 192.375 acres; to the third, 206.625 acres; and to the fourth, the remainder. What was the fourth son's share?

6. In 1897 the rainfall in Ontario for six months was as follows:—April, 2.52 in.; May, 3.38 in.; June, 2.83 in.; July, 5.36 in.; August, 2.62 in.; and September, .83 in. How much did the rainfall during the second three months exceed that during the first three?

7. A gardener sold his cabbages for $212.875 and his turnips for $118.33. The cost of raising the cabbages was $119.75, and the cost of raising the turnips was $99.875. What was his profit on the two crops?

8. A speculator, having 57436 acres of land, sold at different times 536.74 acres, 1756.19 acres, 3678.47 acres, 9572.15 acres, 7536.59 acres, and 4785.94 acres. How much land had he remaining?

9. From a hogshead of sugar containing 397.25 lb., a grocer sold parcels as follows: 110.25 lb., 64.5 lb., 14.25 lb., 29.375 lb., 39.23 lb., and 16.33 lb. How much was left?

10. A flagstaff is made up of two parts, the upper part being 27.84 ft. long, and the lower part 57.86 ft. long. If the lower part is set 11.97 ft. in the ground, how many feet of the whole staff are above the ground?

11. Four men dug a ditch. The first dug .123 of it; the second .234 of it; and the third .343 of it. How much of it did the fourth man dig?

12. On Monday the mercury of a barometer was 30.356 in. high. It fell .017 in. and .153 in. during the next two days. During the next four it rose .008 in., .027 in., .231 in., and .018 in. On the seventh day it fell .132 in. Find its height at the end of the seventh day.

IV. MULTIPLICATION OF DECIMALS.

EXERCISE CLXXXVII.

Multiply:—

1.	4.8 by 4.2	5.4 by 5.6	7.1 by 7.9.
2.	3.5 by 3.5	12.7 by 12.3	10.8 by 10.2.
3.	4.5 by 3.58	.37 by 4.3	5.25 by 3.75.
4.	240.5 by .25	.45 by .21	.27 by .0009.
5.	32.7 by 2.35	.009 by .07	12.5 by 12.5.
6.	61.76 by .071	.6101 by .061	.1234 by 1234.
7.	.0009 by .0009	.084 by .086	.073 by .077.
8.	.0068 by .0062	.0125 by .0125	.075 by .075.
9.	7.006 by 4.05	75.6 by 75.04	245 by .245.
10.	7.007 by 7.007	1.0001 by .001	34.56 by .008.

EXERCISE CLXXXVIII.

Simplify:—

1.	72.5 × .006	8.45 × .008.
2.	37.654 × 13.45	7.0865 × 5.0006.
3.	(2.45 + 3.08) × .0024	(7 — 1.234) × 5.65.
4.	3.075 × 80 × .15	895 × .475 × .004.
5.	.008 × .019 × 25000.	123 × 12.3 × 1.23.
6.	.0525 × 10000	.0927 × 1000.
7.	(101 + 10.1) × 101	(7 — .564) × 8.5.
8.	1.0005 × (3.4 + 5.66)	7.245 × (75 — 36.45).
9.	.0003 × .003 × .03	1000 × .0006 × 8.
10.	.012 × .0012 × 12000	64 × .125 × .004.

EXERCISE CLXXXIX.

1. Multiply 123.456 by 10; by 100; by 1000.

2. What is the product of one thousand and twenty-five, multiplied by three hundred and twenty-seven ten-thousandths?

3. Multiply one hundred and fifty-three thousandths by one hundred and twenty-nine millionths.

4. Multiply five thousandths by seventy-three hundredths.

5. Multiply three hundred and fifty-six thousandths by one hundred and forty-five ten-thousandths.

6. Multiply 4.5 by 10; by 100; by 1000; by 10000.

7. Multiply eight hundred and forty-two thousandths by five hundred thousand.

8. Multiply one hundred and seven thousand, and fifteen ten-thousandths by one hundred and seven ten-thousandths.

9. Multiply twenty-five ten-thousandths by two hundred and seventy-five, and fourteen hundredths.

10. Multiply thirty-four millionths by twenty-six ten-millionths.

EXERCISE CXC.

1. If a man can walk 27.25 miles in a day, how far can he walk in 7.5 days at the same rate?

2. A cubic foot of water weighs 62.5 pounds. What will be the weight of 7.25 cubic feet?

3. What is the profit on one million yards of cotton cloth at $0.007 per yard?

4. How many solid feet are there in a pile of wood 7.3 feet long, 5.7 feet wide, and 6.5 feet high?

5. A roller 4.15 feet in circumference makes 208.4 revolutions in passing from one end of a field to another. Find the length of the field.

6. A is .875 times as old as C, and C is 1.08 times as old as B. B is 25. How old is A?

7. If one cubic inch of pure water weighs 252.458 grains Avoirdupois, how many grains will 1728 cubic inches, or one cubic foot, weigh?

8. A and B start from the same place at the same time, and travel in opposite directions, A travelling at the rate of $22\frac{4}{5}$ miles per day, and B at the rate of 24.64 miles per day. How far apart will they be at the end of 12.45 days?

9. From a cistern containing 2765 gallons, 56.25 barrels, of 31.5 gal. each, are drawn off. How many gallons remain?

10. A man made a journey as follows: He travelled 7.75 hours by rail at the rate of 22.75 miles an hour, 9.875 hours by stage at the rate of 6.75 miles an hour, and 11.75 hours on foot at the rate of 4.62 miles an hour. What was the length of the journey?

V. DIVISION OF DECIMALS.

EXERCISE CXCI.

Divide:—

1.	.8 by 2	8 by .2	2.5 by .05.
2.	12 by .06	124 by .31	.09 by .003.
3.	.08 by 5	.9 by .12	1 by .125.
4.	.51 by .015	.065 by .026	.375 by .025.
5.	.008 by .04	.12 by .0006	.004 by 2.5.
6.	155 by .0625	.00625 by 25	25 by .00625.
7.	272.636 by 6.37	281.8585 by 3.85	9.6188 by 3.46.
8.	46.1975 by 54.35	.014274 by .061	345.15 by .075.
9.	3.6 by .00006	75 by 10000	4.36 by 10000.
10.	216.32 by .00512	5658 by .00123	4.116 by .0075.

EXERCISE CXCII.

Simplify:—

1. 61.04 ÷ 4.36 60.25 ÷ 3.125.
2. 9065 ÷ .049 .0045 ÷ 225.
3. 327.6 ÷ 6.25 5.007 ÷ 375.
4. 16 ÷ .0004 154.28 ÷ .0064.
5. (6.05 + 3.75 — .0048) ÷ .4 (28 + 11.75) ÷ 1.25.
6. .06 × .08 ÷ 3.2 1.2 × .7 ÷ 12.5.
7. 8 ÷ .625 × .01 100 × 4.6125 ÷ .004.
8. 12 ÷ (.015625 + .046875) (7.89 — 3.0111) ÷ .015.
9. (.06 + .006 — .00006) ÷ .06 12 ÷ (.832 — .757).
10. 3.225 ÷ .75 × .01 11.25 × 11.25 ÷ 937.5.

EXERCISE CXCIII.

1. Divide one hundred and forty-seven, and eight hundred and twenty-eight thousandths by nine, and seven tenths.

2. What number must be multiplied by .0017 to give 595?

3. By what must .7847 be divided to give 1.9 for quotient?

4. Divide seventy-five thousand eight hundred and one by two thousand two hundred and ninety-seven ten-thousandths.

5. What is the quotient when 10.9536 is divided by 1000 times .4564?

6. Divide three hundred and twenty-three thousand seven hundred and sixty-five by five millionths.

7. Divide 123.45 by 10; by 100; by 1000; by 10000.

8. What is the sum of the quotients of 24 by 9.6, of 42.75 by 11.4, and of 17.85 by 4.2?

9. The product of three numbers is 2.94294. Two of these are .21 and .11. Find the third number.

10. Divide seven, and five tenths by one hundred; by one thousand; by ten thousand.

EXERCISE CXCIV.

1. If 25 men build 154.125 rods of fence in a day, how much does each man build?

2. There are 16.5 feet in one rod, and 5280 feet in a mile. How many rods are there in a mile?

3. How many bushels of clover seed at $6.25 a bushel will pay for 25 barrels flour at $10.5 per barrel?

4. A man has 324 bushels of apples which he wishes to put into barrels containing 2.25 bushels each. How many barrels will be required?

5. There are 31.5 gallons in a barrel. How many barrels can be filled from 2756.25 gallons?

6. A speculator bought 78.25 acres of land for $9781.25, and sold it so as to gain $3.50 an acre. How much did he get per acre?

7. A man bought a farm containing 64.5 acres for $1773.75. How much did he pay per acre?

8. Twenty-five hundredths of a farm cost $3000. Find the cost of .9 of it.

9. If 20.5 acres of land produce 322.875 bushels of wheat, what is the yield per acre?

10. If a train goes at the rate of 24.75 miles per hour, how long will it be in going 128.7 miles?

VI. REDUCTION OF DECIMALS.

EXERCISE CXCV.

Reduce the following decimals to vulgar fractions in their lowest terms:—

1.	.35	.48	.25	.125.
2.	.625	.75	.375	.64.
3.	.016	.225	.875	.035.
4.	.275	.575	.0375	.005.
5.	.068	.024	.175	.0175.
6.	.99	.021	.123	.003.
7.	2.75	4.76	7.45	5.36.
8.	3.25	9.75	12.725	5.064.
9.	6.0125	16.075	7.875	11.625.
10.	5.3125	2.1875	7.9375	9.6875.

EXERCISE CXCVI.

Reduce the following vulgar fractions to decimals:—

1.	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{8}$	$\frac{3}{8}$.
2.	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{3}{16}$	$\frac{5}{16}$.
3.	$\frac{7}{16}$	$\frac{9}{16}$	$\frac{11}{16}$	$\frac{13}{16}$.
4.	$\frac{4}{25}$	$\frac{6}{25}$	$\frac{11}{25}$	$\frac{18}{25}$.
5.	$\frac{7}{40}$	$\frac{17}{40}$	$\frac{37}{40}$	$\frac{33}{40}$.
6.	$\frac{18}{125}$	$\frac{21}{250}$	$\frac{111}{125}$	$\frac{217}{250}$.
7.	$4\frac{7}{25}$	$3\frac{29}{40}$	$5\frac{31}{40}$	$7\frac{39}{40}$.
8.	$\frac{9}{125}$	$3\frac{17}{250}$	$5\frac{1}{25}$	$7\frac{1}{8}$.
9.	$\frac{27}{750}$	$5\frac{1}{25}$	$7\frac{15}{16}$	$8\frac{9}{25}$.
10.	$\frac{137}{625}$	$\frac{101}{625}$	$\frac{441}{625}$	$\frac{371}{625}$.

EXERCISE CXCVII.

Express each of the following as compound numbers:—

1. £.790625 £.765625 £1.809375.
2. .8325 cwt. .08745 t. 3.8975 t.
3. .7875 mi. .2525 mi. 21.36875 mi.
4. .9075 A. .88125 A. 13.4375 A.
5. .9375 cu. yd. 7.875 cd. 9.75 cu. yd.
6. .875 bu. 2.375 bu. 5.475 bu.
7. .875 gal. 5.175 gal. 7.75 gal.
8. .495 da. 7.875 wk. 9.95 wk.
9. .975° 2.8475° 17.3875°.
10. .625 fathom. 17.875 rm. 7.75 gro.

EXERCISE CXCVIII.

Express each of the following as a decimal of its highest denomination:—

1. £1 10s. 6d. £7 13s. $7\frac{1}{2}$d.
2. 9 t. 17 cwt. 8 lb. 5 t. 14 cwt. $7\frac{1}{2}$ lb.
3. 7 mi. 35 rd. 2 yd. 2 ft. 3 in. 6 mi. 28 rd. 2 yd. 1 ft. 11.04 in.
4. 9 A. 48 sq. rd. 7 A. 45 sq. rd. 8 sq. yd. 4.23 sq. ft.
5. 7 cd. 112 cu. ft. 7 cu. yd. 18 cu. ft. 972 cu. in.
6. 7 bu. 3 pk. 2 qt. 5 bu. 3 pk. 4 qt. 1 pt.
7. 27 gal. 3 qt. 1 pt. 14 gal. 1 qt. 1 pt.
8. 3 da. 13 hr. 24 min. 36 sec. 2 wk. 5 da. 9 hr. 46 min. 48 sec.
9. 3° 52′ 39″ 17° 7′ 25.5″.
10. 5 rm. 17 qr. 18 sheets. 24 grs. 9 doz.

VII. APPLICATIONS OF PREVIOUS RULES.

EXERCISE CXCIX.

1. What will be the cost of filling in a street 600 ft. long and 65 ft. wide, averaging $4\frac{1}{2}$ ft. below grade, at $.52 a cubic yard?

2. Goliath of Gath was $6\frac{1}{2}$ cubits high. What was his height in feet, the cubit being 1 ft. 7.168 in.?

3. What will be the cost of the wood that fills a shed 20 ft. long, 10 ft. wide, and 8 ft. high, at $4.75 a cord?

4. Which will contain more—a box 5.5 inches long, 4 inches wide, and 4.25 inches deep, or one 6.5 inches long, 4.5 inches wide, and 3.5 inches deep?

5. How much gold may be obtained from a ton of quartz rock, if it yields .0016 of its weight in gold?

6. At 67½ cents per cu. yd., what will be the cost of digging a cellar 15.5 ft. long, 12 ft. wide, and 5 ft. 4 in. deep?

7. How many yards of carpeting 1 yard wide will be required to cover a floor 33.5 ft. long and 22½ ft. wide?

8. What is the cost of slating a roof 52 ft. 10 in. long, each side being 20 ft. wide, at $15.25 per square, a square being 100 sq. ft.?

9. If 1 cu. ft. of water weighs 1000 oz., what will be the weight of the water in a cistern 8.5 ft. long, 6 ft. 3 in. wide, and 3 ft. 9 in. deep?

10. At $13.60 per square, what will be the cost of tinning both sides of a roof 36 ft. 6 in. in length, and each side 18 ft. 9 in. in width, a square being 100 sq. ft.?

EXERCISE CC.

1. If 11.8 A. of land cost $236, what will 20.7 A. cost at the same rate?

2. Find the cost of 8725 ft. of boards at $12.50 per thousand?

3. A drover bought sheep at $3.37½ a head, and sold them at $3.87½ a head, and gained $37.50 by the transactions. How many sheep did he buy?

4. What is the cost of 24 cwt. 87 lb. of sugar at $6.50 per hundredweight?

5. The contents of a chest of tea weighing 87.5 pounds are made up into an equal number of 1 pound, ½ pound, and ¼ pound packages. How many packages are there of each kind?

6. What would 7⅘ bales of cotton cost, each bale weighing 537.5 pounds, at $0.11¾ a pound?

7. Boys in playing hare and hound run 3.875 miles. The hares drop a piece of paper every 5.5 feet on the average. How many pieces do they drop?

8. A merchant sold 4 pieces of matting, each containing 35.5 yards, at $0.375 per yard. How much money did he receive?

9. Divide $47.10 among 6 men and 11 youths, giving a youth 0.525 of a man's share. What is each man's share?

10. The great pyramid of Cheops measures 763.4 feet on each side of its base, which is square. How many acres does it cover?

EXERCISE CCI.

1. Bought land at $62.50 an acre, and sold it again at $75 an acre, thereby making $846.875. How many acres were bought?

2. If .875 of a man's age is 35 years, what will .7 of his age be?

3. If .75 of a ton of steel rails is worth $72, what is the value of 275.875 tons?

4. Divide 16.34 into two parts, so that one part may be 1.56 larger than the other.

5. A man spent .875 of his money and has $1.29 left. How much had he at first?

6. Bought 67.75 acres of land at $62.50 an acre, and sold the lot for $5081.25. Was there a gain or loss? How much was gained or lost on the whole, and how much an acre?

7. Divide $133.26 between A and B so that A may have $18.48 cents more than B.

8. What number is that which, being diminished by 2.75, the remainder, multiplied by 4.6, and the product, increased by 6.75, gives 70?

9. How many cu. ft. of water will pass under a bridge every 12 min. if the stream is 125.125 ft. wide and 4.8 ft. deep, and flows at the rate of 2.5 mi. per hour?

10. Two men who are 17.82 miles apart start at the same time to walk towards each other, one at the rate of 3.27 mi. per hr. and the other at the rate of 3.48 mi. per hr. How far will each walk before they meet?

EXERCISE CCII.

1. What is the price of 20 joists, 10 ft. long, 6 in. wide, and 2 in. thick, at $25 per M.?

2. What is the cost of 576 fence boards 16 ft. long and 9 in. wide, at $14 per M.?

3. During a week the barometer stood as follows:—On 3 days at 29.46 in., on 2 days at 30.05 in., on the other two days at 29.48 in. and 30.85 in. What was the average for the week?

4. In walking 3.6 mi. a girl took 7040 steps. What was the average length of her step?

5. Find the average of 2.6, 2.37, 3.025, 2.973, and 0.516.

6. Find the G.C.M. and L.C.M. of 2.25, 3.375 and 2.8125.

7. How many boxes 4.5 ft. by 3.25 ft. by 2.875 ft., outside measurement, can be stored in a room 52 ft. by 36 ft. by 345 ft.?

8. If a block of English oak 3½ ft. long, 2 ft. broad, and 1.75 ft. thick, weighs 710.5 lb., find the weight of a cu. ft. of English oak.

9. What will be the cost of painting the walls of a room, at $.30 per sq. yd. the length being 19 ft. 10¼ in., the breadth 16 ft. 1¾ in., and the height 10.25 ft.?

10. A merchant fails in business and his assets pay $.425 on the dollar. How much does a creditor receive to whom he owes $453.60?

EXERCISE CCIII.

1. Find the sum of the sum, difference, and product of seven, and twenty-five hundredths and three, and eighty-four hundredths.

2. Find the sum of the sum, difference, product, and two quotients of 1.6 and 4.

3. 2.5 times the sum of two numbers is 35.25 and one is 2.8 more than the other. Find the numbers.

4. Two men together chopped 50.75 cords of wood and one chopped 1.45 cords more than the other. How much did each chop?

5. Two men are 120.25 miles apart. They walk straight towards each other and when they meet one has gone 7.75 mi. less than the other. How far has each gone?

6. If a merchant deposits $375.50 in a bank at one time, and $487.75 at another, how much will remain after he has withdrawn $176.37 and $346.83?

7. Bought 1 barrel of flour at $8.50; 3 bushels of corn at $.565 a bushel; 24.5 pounds of sugar at 8½c. a pound; 3 gallons of molasses at 37½c. a gallon; 2 pounds of tea at 62½c. a pound; 6 pounds of coffee at 35c. a pound; 15 pounds of rice at 8c. a pound; and 4 pounds of butter at 22c a pound. What was the cost of the whole?

8. A guinea is 21 shillings. Reduce 7½ guineas to the decimal of £10.

9. A stick of square timber is 17.5 in. wide by 13.5 in. thick. What length must be cut off to contain 7 cu. ft.?

10. What must be the length of a plot of ground, its breadth being 76.23 yd., to contain 232.848 sq. rd.?

11. Divide $302.50 among A, B, and C so that A may receive 1.5 times as much as the other two together, and B, 1.75 times as much as C. Find the share of each.

12. In sinking a shaft it is found that .375 of it passes through earth, .075 of it through shale, and the remainder through solid rock. The shale is 90 ft. deep. How much of the shaft is in the solid rock?

13. A stick of square timber 32.5 ft. long, 2.5 ft. wide, and 1.125 ft. thick, weighs 4387.5 pounds. Another stick of the same kind of timber is 21.75 ft. long, 1.875 ft. wide, and 1.25 ft. thick. How much does the second stick weigh?

14. A piece of work can be done by A in 17.5 days; by B in 22.5 days; and by C in 15.75 days. If A works alone at it for 5.5 days and is then joined by B and C, how long must the three work together to finish the remainder?

CHAPTER VIII.

PERCENTAGE.

The expression **Per Cent.** (Latin per centum) means *for*, or *by the hundred.*

A Rate Per Cent. denotes a certain number of hundredths, as 6 per cent. denotes $\frac{6}{100}$ or .06; $\frac{3}{4}$ per cent. denotes $\frac{\frac{3}{4}}{100}$ or .0075.

The symbol $^{o}/_{o}$ is used for the phrase per cent.

EXERCISE CCIV.

Express the following as hundredths:—

1. 5% 7% 10% 15% 27%.
2. $7\frac{1}{2}$% $6\frac{1}{4}$% $12\frac{1}{2}$% 20% 50%.

Express the following decimals in percentage:—

3. .05 .07 .1 .17 .25.
4. .055 .0725 .105 .125 .1725.

Express the following—(1) as decimals, and (2) as common fractions in their lowest terms:—

5. 5% 8% 10% $12\frac{1}{2}$% 20%.
6. $11\frac{1}{9}$% $16\frac{2}{3}$% $37\frac{1}{2}$% 75% $87\frac{1}{2}$%.

Express as hundredths and also in percentage:—

7. $\frac{1}{4}$ $\frac{3}{4}$ $\frac{2}{5}$ $\frac{7}{10}$ $\frac{4}{25}$.
8. $\frac{1}{3}$ $\frac{2}{3}$ $\frac{1}{6}$ $\frac{1}{8}$ $\frac{3}{8}$.

Express the following as fractions in their lowest terms:—

9. 4% 40% 80% 15% 30%.
10. $33\frac{1}{3}$% $6\frac{1}{4}$% $8\frac{1}{3}$% $5\frac{5}{9}$% $62\frac{1}{2}$%.

EXERCISE CCV.

Find the following:

1. 3% of $100   5% of $400   7% of $500.
2. 4% of 400 acres.   8% of 250 A.   16% of 75 A.
3. 6% of 250 words   6% of 550 words   6% of 900 cows.
4. 10% of 500 boys   107% of $350   10% of 150 yards.
5. 20% of $250   25% of 750 mi.   75% of 60 hens.
6. 1% of 200 men. $\frac{1}{2}\%$ of 400 yd. $\frac{1}{5}\%$ of \$200.
7. $2\frac{1}{2}\%$ of \$2600 $12\frac{1}{2}\%$ of 400 a. $8\frac{1}{3}\%$ of 660 men.
8. $11\frac{1}{9}\%$ of 270 yd. $33\frac{1}{3}\%$ of 750 sheep. $6\frac{2}{3}\%$ of 450 cows.
9. 40% of $755   25% of 1660 men. $37\frac{1}{2}\%$ of 576 books.
10. 100% of 79 $87\frac{1}{2}\%$ of 1664 yd. $22\frac{2}{9}\%$ of \$7209.

EXERCISE CCVI.

Find the rate per cent. equal to each of the following:—

1. $5 per $25 $8 per $80 $15 per $60.
2. 1 hr. per 10 hr.   5 lb. per 1 cwt. $60 per $480.

What per cent is:—

3. 8 of 16? $5 of $40?   20 mi. of 450 mi.?
4. 3 ft. of 60 ft.?   7 mi. of 100 mi.?   880 ft. of 3 mi.?
5. 240 lb. of 1 ton?   84 men of 1200 men? $96 of $1920?
6. 24 da. of 480 da.?   50 men of 80 men?   5 qt. of 10 gal.?

Find the difference between the following:—

7. 30% of \$100 and $\frac{2}{5}$ of \$100; 60% of 200 A. and $\frac{5}{8}$ of 200 A.
8. $\frac{4}{5}$ of 80 lb. and 50% of 80 lb.; $\frac{3}{4}$ of 80 gal. and 80% of 80 gal.

Find the sum of the following:—

9. $40 and 5% of $40 $100 and 7% of $100.
10. $60 and 50% of $60   50 mi. and 10% of 50 mi.

EXERCISE CCVII.

1. A farmer having 1200 sheep lost 37% of them. How many did he lose?

2. A lawyer collected $2575 for a merchant, charging 4% for his services; what was his charge?

3. A ship loaded with 1875 bales of cotton was overtaken by a storm, and the sailors threw overboard 12 per cent. of the cotton; how many bales were lost?

4. In a warehouse 1920 boxes of tobacco were stored; the warehouse having taken fire, 15% of the tobacco was burned. How many boxes were burned?

9. A dealer paid \$620 for goods at 22½% off. Find the list price of the goods.

10. I am charged \$2.50 for a book, which the bookseller says is 33⅓% less than it cost him. Find the cost.

EXERCISE CCXIV.

1. Find the net price of goods bought as follows:—

Invoice price \$375, discount off 20% and 10%.
Invoice price \$800, discount off 25% and 10%.
Invoice price \$800, discount off 20%, 10% and 5%.
Invoice price \$1640, discount off 25%, 10% and 5%.

2. What is the net cost to the purchaser of hardware invoiced at \$815 and subject to a discount of 20%, 10% and 5%?

3. A's list price for pocket-knives is \$9 per dozen, 20% and 5% off. B's list price is \$9.50 per dozen, 25% and 10% off. How much will be saved by ordering 24 dozen knives from B rather than from A?

4. At what price must goods be marked to sell for \$2.72 after allowing 15% discount?

5. At what price are goods listed that sell for \$18 after allowing 20 and 10 off?

6. If goods cost \$3.60, what must be the invoice price to allow discounts of 25%, 20% and 10%?

7. At what price must goods which cost \$216 be listed to give 25% gain after allowing 25, 20 and 10 off?

8. At what price must goods which cost \$1.52 be listed to give 12½% gain after deducting discounts of 20%, 10% and 5%?

9. What single discount is equivalent to a discount of 25% and 10%?

10. What single discount is equivalent to 25%, 20% and 10% off?

EXERCISE CCXV.

1. What is the difference on a bill of \$425 between a discount of 50% and a discount of 30% and 20%?

2. A bookseller wishes to mark a book which cost \$2.00 that he may allow a discount of 25% and still make a profit of 20%. What must be the marked price?

3. What direct discount is equivalent to a discount of 20% and 10%?

4. A bookseller buys at a discount of 20%, 10% and 5% off, and sells at list prices. What per cent. profit does he make?

5. The selling price of an article was \$25 when the rate of gain was 25%. Find its cost price?

6. If \$1.40 is gained by selling goods at 25% above cost, find what selling price would make the rate of gain 35%.

7. An invoice was $646, trade discount 20 and 5 off. Find the cost of the goods.

8. A dealer bought a book, list price $1.00, at a discount of 25%, and afterwards sells the book at $1.00. What per cent. does he gain?

9. What is the net amount of a bill for $720, discounts being 25, 10 and 5 off?

10. A man purchases goods, list price $680, discounts being 33⅓%, 12½% and 10%. Find the net amount of the bill; also, a single discount equivalent to these three.

II. PROFIT AND LOSS.

Profit and Loss, as a commercial term, denotes the gain or loss in business transactions.

Profit is the amount by which the selling price exceeds the cost price.

Loss is the amount by which the selling price falls short of the cost price.

The **Rate of profit or loss** is usually expressed as a certain percentage of the cost price.

EXERCISE CCXVI.

1. Find the profit or the loss on the following:—

Cost $6, selling price $8; cost $15, selling price $23.
Cost $115, selling price $113.50; cost $75.50, selling price, $77.

2. Find the gain or the loss per cent. on the following:—

Cost $6, selling price $8; cost $80, selling price $125.
Cost $7.50, selling price $9; cost $100, selling price $95.

3. Find the profit or the loss in the following:—

Cost $100, gain 10%; cost $500, loss 8%.
Cost $65, gain 8%; cost $450, gain 33⅓%.

4. Find the selling price in the following:—

Cost $40, gain 7½%; cost $80, loss 6¼%.
Cost $120, loss 15%; cost $75, gain 33⅓%.

5. Find the cost price in the following:—

Selling price $110, gain 10%; selling price $210, gain 5%.
Selling price $40, loss 33⅓%; selling price $84, gain 16⅔%.
Selling price $65, gain 8⅓%; selling price $72, loss 25%.

6. Find the cost in the following:—

Profit $3, gain 10%; profit $8, gain 5%.
Loss $5, loss 20%; loss $56, loss 8%.

7. A flock of sheep increases from 88 to 110 in a year. What is the gain per cent.?

8. Bought books for $420, and sold them for $357. Find my loss per cent.

9. If Mr. Jones buys a farm for $3875, and sells it for $3720, what per cent. does he lose?

10. If I buy paper at $3.50 a ream, and sell it at 25c. a quire, what is the gain per cent.?

EXERCISE CCXVII.

1. A merchant sold cloth which cost $1.75 per yard so as to gain 8%. Find the selling price.

2. Goods which cost $735 were sold at 26% gain. Find the selling price.

3. At what price must goods be sold to lose 12%, if they cost $43.50.

4. Bought a house for $3500, expended $750 in repairing it, and then sold it so as to lose 15% on the whole cost. What did I receive for it?

5. Sold goods at a loss of 20%, an actual loss of $59.50. What was the selling price?

6. Find the selling price of goods by which there is a loss of 2% and an actual loss of $55.50.

7. A farmer bought 35 A. of land for $1750, and sold it at 20% gain. How much did he get per acre?

8. Mr. Smith bought a house for $5600 and spent $400 more for repairs. He sold it at 15% gain on the whole cost. What was his profit?

9. A quantity of wheat which cost 72 ct. per bu. was sold at a loss of 20%; the total loss was $1296. How many bushels were there?

10. A grocer sold potatoes for $16.10, gaining 15%. If he had sold them for $18.20, how much would he have made above the cost price?

EXERCISE CCXVIII.

1. A set of jewelry was sold for $140 at a gain of 25%. What did the set cost?

2. A produce dealer sold a shipment of wheat at a loss of 5%, realizing as the net proceeds $8170. What was the cost?

3. A merchant sold rye at 15% gain. His profit was $26.70. How much did he receive for the rye?

4. A man gained 24% by selling land for $195 more than he paid for it. How much did he receive for the land?

5. Ten cows were sold for $690, at a gain of 15%. For how much per head, on the average, should they have been sold to gain 25%?

6. A merchant lost 25% by selling flour at $6 per barrel. If he had sold it at $9 per barrel, what would have been the gain per cent.?

7. I sold a horse for $240 and lost 20%. For what should I have sold him to have gained 10%?

8. A building lot was sold for $1840, at an advance of 15% on its cost. What would have been the gain per cent. if it had been sold for $2240?

9. I bought a lot of goods for 15% below market price, and sold them for 15% above market price. What per cent. did I clear?

10. Sold my carriage at 30 per cent. gain, and with the money bought another, which I sold for $182, and lost 12½ per cent. How much did each carriage cost me?

III. COMMISSION.

Commission is the compensation received by an agent for transacting certain kinds of business. It is generally reckoned at a rate per cent. on the money involved.

The agent is variously known as **Commission Merchant, Broker, Collector, Factor,** &c.

In **selling,** the Commission is reckoned on the money received by the agent.

In **buying,** the Commission is reckoned on the money paid by the agent.

EXERCISE CCXIX.

Find the commission on the following:—

1. $450 at 4% $360 at 2⅓% $575 at 4⅕%.
$1260 at 4½% $5700 at 3⅔% $1875 at 4⅔%.

Find the commission on the following:—

2. $2500 at ½% $6440 at ¼% $3660 at ⅔%.
$3600 at 1⅛% $4800 at ⅞% $8400 at ⅛%.

3. An agent received a consignment of flour, which he sold for $3750. What was his commission at 4½%?

4. My agent in Chicago has purchased wheat for me to the amount of $7728. What is his commission at 1½ per cent.?

5. My agent buys goods for $2500 at ½ per cent. commission. What is his commission?

6. An agent buys 4275 bushels of wheat at 68 cents a bushel. What is his commission at ⅜%?

7. My agent in Paris has bought for me 6 bales of French calico, each bale containing 50 pieces of 30 metres each, at 25 cents a metre. What is his commission at ⅗ per cent.?

8. An agent bought goods to the value of $3200 and received $96 as his commission. What rate did he charge?

9. Find the rate of commission when $78 is paid for selling goods of the value of $5200.

10. A real estate broker charged $535.50 for buying a factory for $15750. What rate did he charge?

EXERCISE CCXX.

1. An agent sold 210 yd. of cloth at 90 ct. a yd. and charged $5.67 for doing so. Find the rate charged?

2. An agent sells 60000 lb. of tea at 25 ct. per lb. and remits the net proceeds $14625. What is his rate of commission?

3. An agent sold 500 pieces of muslin, each containing 21 yd., at 23 ct. a yard. He remitted to the owner $2334.50. What was the rate of commission?

4. Find the sum for which goods were sold when the commission at 2½% is $360.

5. An agent who charged 5¼% commission sells lumber and receives $441 for his services. What is the value of the lumber sold?

6. An agent received $129.64 for selling goods on 5% commission. Find the value of the goods sold.

7. An agent received $168 for selling 5000 bu. of wheat on a commission of 4%. What price per bushel was received?

8. An agent sold a house on 3% commission and sent the owner $6984. What sum did the agent receive for the house, and what was his commission?

9. An agent, who charged 5% for collecting, paid over to a society $1482, as the net proceeds of bills collected from its members for one year's dues. The annual dues being $10, how many members paid him?

10. A real estate broker sold a house on 6¼% commission, and sent to the owner as net proceeds $3060. What sum was received for the house?

EXERCISE CCXXI.

1. An agent bought 40 horses on commission, at 4½%; he paid $25 for keeping and $50 for transportation, which, with his commission, amounted to $345. What did the horses cost each?

2. A flour merchant remits to his agent in Chicago $3796, for the purchase of grain, after deducting the commission at 4%. How much will the agent expend for his employer, and what will be the commission?

3. A miller sent his Montreal agent $9270 to be invested in flour, after deducting his commission of 3%. What was the commission?

4. Sent to my agent in Boston $3825 to be invested in French prints at $.15 per yard, after deducting his commission of 2%. How many yards shall I receive?

5. An agent received $2040 to be invested in sugar at $3\frac{1}{3}$ ct. per pound, after deducting his commission of 2%. How many pounds did he buy?

6. What weight of wool at 40 ct. a lb. can be bought for $1722 by my agent, after deducting his commission of 5%?

7. I sent $2678 to my agent to invest in calico at 5 ct. per yard after deducting his commission at 3%. How many yards did I receive?

8. A speculator received $3290, as the net proceeds of a sale, after allowing a commission of 6%. What was the value of the property?

9. A lawyer collected 75% of a debt of $1260, and charged 5% commission on the sum collected. What did the creditor receive?

10. I sent a quantity of dry goods into the country to be sold at auction, on commission of 9%. What amount of goods must be sold that my agent may buy produce with the net proceeds, to the value of $3500, after retaining his purchase commission of 4%?

IV. INSURANCE.

Insurance is a contract whereby one party, in consideration of a certain sum, guarantees another party against loss by fire or accident.

The Premium is the sum paid for the insurance. It is always a certain percentage of the sum insured.

The Policy is the written contract, given by the insurer to the insured.

EXERCISE CCXXII.

Find the premium on the following:—

1. $ 850 at 1% $1200 at $\frac{3}{4}$% $ 900 at $\frac{2}{3}$%.
$1500 at $\frac{4}{5}$% $3200 at $\frac{3}{4}$% $8000 at .75 %.
$6000 at .70% $5500 at .80% $6600 at .66$\frac{2}{3}$%.

2. Find the cost of insuring property worth \$15000 at $\frac{4}{5}\%$, if $\frac{2}{3}$ of the value is insured.

3. A insured his house for 1 year for \$8000 at the rate of $\frac{1}{2}\%$, and his furniture for \$3000 at the rate of $\frac{7}{8}\%$. What was the total premium?

4. A cotton factory worth \$25000, and the machinery and stock worth \$35000, are insured for $\frac{1}{2}$ their value, at $\frac{3}{4}\%$. What is the premium?

5. A cotton factory and its machinery, valued at \$75000, are insured at $\frac{9}{10}$ per cent. What is the yearly premium? and if it should be destroyed, what loss would the insurance company sustain?

6. What will be the cost of insuring 4000 bu. of wheat worth 75 ct. a bushel, at $\frac{3}{4}\%$?

7. The Royal Insurance Company took a risk of \$16000, for a premium of \$280. What was the rate of insurance?

8. A company charges \$20.25 for \$2700 insurance. What is the rate charged?

9. I have goods worth \$37560, which I insure for $\frac{4}{5}$ of their value, paying \$262.92. What is the rate?

10. The sum of \$280 was paid for the insurance at $\frac{4}{5}$ of its value of a storehouse worth \$40000. What was the rate charged?

EXERCISE CCXXIII.

1. At $\frac{4}{5}\%$, how much insurance can be effected upon a store for \$128?

2. For what sum was a house insured, if the premium paid was \$24 and the rate of insurance $\frac{4}{5}\%$?

3. A company charged \$225 for insuring property at $1\frac{1}{8}\%$ premium. What was the value of the policy?

4. A man pays \$87.50 for the insurance of house at $\frac{7}{8}\%$, and \$50 for the insurance of furniture at $1\frac{1}{4}\%$. If both are destroyed by fire, how much will he receive?

5. Find the cost of insuring $\frac{5}{6}$ of the value of 6000 bbl. of flour worth \$9.60 a barrel, the insurance being reckoned at $\frac{7}{8}\%$.

6. A vessel and cargo, valued at \$35000, are insured at $\frac{3}{4}$ per cent. Now, if this vessel should be destroyed, what will be the actual loss to the insurance company?

7. I insure a factory for one year, at $\frac{9}{10}\%$, for $\frac{3}{4}$ of its value. The premium is \$270. How much is the factory worth?

8. I buy a house for \$8000, and get it insured for $\frac{3}{4}$ of its value, at $\frac{3}{8}\%$. If the house is burned, what is my loss? What is the loss of the insurers?

9. An insurance company, having taken a risk of \$20000 at $\frac{7}{8}\%$, reinsured \$8000 at $\frac{3}{4}\%$ with another company, and \$6000 at $\frac{3}{8}\%$ with another. If no loss occurs, what does the first company gain?

10. A building worth \$150000 is insured in three companies; in the first for \$25000, in the second for \$35000, and in the third for \$40000. For what is each company liable in case of damage to the extent of \$10000?

V. TAXES.

A Tax is a sum of money levied on the person, property or income of individuals for public purposes.

Taxes on property or income are reckoned at a certain **rate per cent.** of the assessed value of the property or income, or at a certain number of mills on the dollar.

Taxes are of two kinds:—**Direct Taxes** and **Indirect Taxes.**

Direct Taxes are levied by the Province, Township, Town, or City.

Indirect Taxes are called **Duties** and are levied by the Dominion.

Customs Duties are levied on articles imported from other countries.

Excise is a duty on articles manufactured in the country itself.

Duties are either **Ad Valorem** or **Specific.**

An Ad Valorem Duty is reckoned at a certain rate per cent. of the cost of the goods in the country from which they have been imported.

A Specific Duty is a fixed sum levied on the quantity of goods without regard to their cost.

EXERCISE CCXXIV.

1. Find the tax on \$4500 at 12 mills on the dollar.

2. Find the tax on property assessed at \$7500 at 2%.

3. The law exempts \$700 of income from being taxed. What does A, whose salary is \$2000, pay when the rate is 15 mills on the dollar?

4. Find the duty on furniture, the invoice price of which is $1750, at 30%.

5. A hardware merchant imports cutlery to the value of $2175. What duty must he pay at 30%?

6. What is the duty on a case of sardines containing 440 boxes at 5 ct. per box?

7. Find the duty on 800 lb. of sugar candy worth 5 ct. per lb., the specific duty being ½ ct. per lb. and the ad valorem duty 35%.

8. What is the rate of taxation, when property assessed for $2750 pays $38.50 tax?

9. What is the rate of taxation, when $120 is the tax upon $9600?

10. Find the rate of taxation, when $28 is the tax on $1600.

EXERCISE CCXXV.

1. What is the assessed value of property on which the tax is $31.50 at 11¼ mills on the dollar?

2. The rate is 16½ mills on the dollar. A's income tax is $29.70. What is A's income, $700 of it being exempt?

3. The expense of building a public bridge was $1768, which was defrayed by a tax upon the property of the town. The rate of taxation was 3¼ mills on one dollar. What was the valuation of the property?

4. The duty upon stockings is 35%. What is the invoice cost of stockings upon which $35.56 duty is paid?

5. What is the invoice cost of goods upon which $625 duty is paid, if the duty is reckoned at 25%?

6. If a tax of $12350 is to be raised, and the collector receives 5% for collecting the taxes, what sum must be levied?

7. What sum must be assessed in order to raise a net amount of $5561.50, and pay the commission for collecting at 2%?

8. In a certain section a schoolhouse is to be built at an expense of $9600, to be defrayed by a tax upon property valued at $1536000. What shall be the rate of taxation?

9. In a school section, a tax of $375 is levied for the support of schools. What is A's tax on a valuation of $4000, the entire valuation of the district being $60000?

10. A town is to be taxed $23200 on an assessed valuation of $2900000. What is A's tax on an assessed valuation of $14275?

VI. SIMPLE INTEREST.

Interest is money paid for the use of money.

The Principal is the sum for the use of which interest is paid.

The Amount is the sum of the Principal and Interest.

The Rate of Interest is the rate per cent. of the principal allowed for its use for one year.

Interest is either **Simple** or **Compound.**

Simple Interest is the sum charged for the use of the Principal only.

Compound Interest is interest reckoned on the principal and also on the accrued interest as it falls due from period to period.

EXERCISE CCXXVI.

1. Find the interest on the following:—

$100 at 6% for 1 yr.	$200 at 4% for 1 yr.
$150 at 4% for 6 mo.	$560 at 5% for 3 mo.
$350 at 6% for 4 mo.	$450 at 4% for 6 mo.

2. What will be the interest on $360 for 5 mo. at 6%?

3. If $3500 borrowed money is repaid in 73 days, how much interest should be paid, money being worth 8%?

4. Find the simple interest on $4800 for 1 yr. 5 mo. at 5%.

5. Find the interest on $250 for 6 mo. at 8%.

6. What is the interest on $803 for 35 days at the rate of 7% per annum?

7. Find the interest on $876 for 105 days at 6%.

8. Find the interest on $1752 from June 3 to Oct. 16 at 6%.

9. What interest is due on $584 from March 7 to August 19 at 5%.?

10. Find the interest on $131.40 from Sept. 5, 1899, to March 7, 1900, at 7%.

EXERCISE CCXXVII.

Find the amount of the following:—

	Principal.	Rate.	Time.
1.	$ 872	6 %	10 mo.
2.	$ 942	6 %	15 mo.
3.	$1896	7 %	17 mo.

4.	$657	7 %	June 2 to Oct. 15.
5.	$511	5 %	April 1, 1899, to Jan. 21, 1900.
6.	$408.80	7 %	July 3, 1899, to Feb. 3, 1900.
7.	$1728	6½ %	1 yr. 2 mo.
8.	$60	8 %	1 yr. 3 mo.

9. J. Ayer has D. How's note for $1825, dated Dec. 29, 1899; what is the amount Oct. 9, 1900, at 6 per cent.?

10. B gives his note, August 6th, 1899, for $1095, interest at 7%; he pays the note and interest May 17th, 1900, how much did he pay?

EXERCISE CCXXVIII.

What is the rate per cent. when

1. The interest on $450 for 1 yr. is $27?
2. The interest on $950 for 16 mo. is $88⅔?
3. The interest on $380 for 1 yr. 4 mo. is $22.80?
4. The interest on $511 for 75 da. is $7?
5. $480 amounts to $510 in 1 yr.?
6. $600 amounts to $613.75 in 5 mo.?
7. $1168 amounts to $1195.60 in 115 da.?
8. The amount of $1022 for 260 days is $1054.76?
9. The interest on $803 from June 10 to Dec. 2 is $23.10?
10. The amount of $876 from April 10 to Dec. 1 is $909.84?

EXERCISE CCXXIX.

Find the time in which

1. The interest on $456 at 6% will be $27.36.
2. The interest on $540 at 4½% will be $36.45.
3. The interest on $846 at 6% will be $63.45.
4. The interest on $1500 at 7% will be $43.75.
5. The amount of $1600 at 5½% will be $1666.
6. The amount of $750 at 7% will be $785.
7. The amount of $2920 at 4½% will be $2961.40.
8. The interest is $\frac{9}{160}$ of the principal at 4½%.
9. The amount of $733.65 will be $751.74 at 6%.
10. A principal of $1314, loaned May 12, 1899, at 5½%, will amount to $1328.85.

EXERCISE CCXXX.

Find the principal that

1. Produces $24.30 interest in 1 yr. at 4½%.
2. Produces $39.30 interest in 1 yr. 6 mo. at 4%.
3. Produces $21.25 interest in 6 mo. at 5%.

4. Produces \$22.50 interest in 1 yr. at 6¼%.
5. Produces \$56 interest in 1 yr. 4 mo. at 5%.
6. Produces \$22.50 interest in 8 mo. at 4½%.
7. Produces \$12.96 interest in 90 da. at 6%.
8. Produces \$56.25 interest in 225 da. at 5%.
9. Produces \$6.48 interest at 6% from June 5 to Dec. 2.
10. Produces \$105 interest at 7½% from April 15 to Oct. 7.

EXERCISE CCXXXI.

Find the principal that

1. Amounts to \$265 in 1 yr. at 6%.
2. Amounts to \$496 in 1 yr. 4 mo. at 5%.
3. Amounts to \$596.70 in 1 yr. 6 mo. at 7%.
4. Amounts to \$595.40 in 8 mo. at 6%.
5. Amounts to \$1391.50 in 1 yr. 1 mo. at 5%.
6. Amounts to \$424.83 in 9 mo. at 5½%.
7. Amounts to \$796⅝ in 1 yr. 3 mo. at 5%.
8. Amounts to \$1782.60 in 85 da. at 7½%.
9. Amounts to \$3735.50 from June 3 to Dec. 10 at 4½%.
10. Amounts to \$3338.50 from April 17 to Dec. 3 at 6¼%.

VII. COMPOUND INTEREST.

EXERCISE CCXXXII.

Find the compound interest and the amount of

1. \$800 at 5%, compounded annually, for 3 yr.
2. \$2500 at 6%, compounded annually, for 3 yr.
3. \$1250 at 4%, compounded half-yearly, for 18 mo.
4. \$8000 at 5%, compounded annually, for 4 yr.
5. \$10000 at 12%, compounded quarterly, for 1 yr.

Find the principal which will produce

6. \$648.90 interest at 6%, compounded annually, for 2 yr.
7. \$151.32 interest at 5%, compounded annually, for 3 yr.
8. \$927.27 interest at 6%, compounded half-yearly, for 18 mo.

9. How much greater is the compound interest on \$1200 for 2 yr. at 6%, compounded yearly, than the simple interest for the same time?

10. How much greater is the compound interest on \$8000 for 2 yr. at 10%, compounded half-yearly, than the simple interest for the same time?

VIII. BANK DISCOUNT.

Bank Discount is the charge made by a bank for advancing the payment of a note not due. It is equal to the simple interest on the *face value* of the note, for the time between the date of buying the note and the time it falls due. The banker deducts the discount from the *face value* of the note and pays the balance, which is called the **Proceeds** of the **Note.**

A Promissory Note is a promise in writing, made by one person to another, to pay on demand, or at a designated time, a specified sum of money.

The Maker of the **Note** is the person who signs the note.

The Payee is the person to whom, or to whose order, the note is made payable.

The Holder is the person who has legal possession of the note.

The Face of the **Note** is the sum for which it is given.

The Maturity of a note is the time at which it becomes legally due.

Days of **Grace** are three days which elapse from the time specified in the note for its payment until it is legally due. The time that elapses between the day of discounting the note and the day of maturity, called the term of discount, includes the days of grace.

A Negotiable Note is one which is made payable to **bearer,** or to the order of the **payee.** It can be sold to another. If payable to bearer, no endorsement is necessary. If payable to the order of the payee, it must be **endorsed** by him before being disposed of.

The **Payee** endorses the note by writing his name across the back of the note.

PROMISSORY NOTE.

$300. Toronto, May 18, 1900.

Sixty days after date I promise to pay Nicholas Walsh, or order, $300, value received. JOHN BRYCE.

There are **three parties** to a draft:—

The Drawer, the person who makes the draft,—the person who orders the money to be paid.

The Payee, the person in whose favor it is drawn.

The Drawee, the person on whom it is drawn.

If the draft is accepted, the **Drawee** becomes the **Acceptor.**

DRAFT.

$100. Toronto, Jan. 15th, 1900.

Ten days after sight pay to the order of James Mills the sum of one hundred dollars for value received, and charge the same to the amount of

THOMAS LOVELL.

To John Smith, Esq.,
Merchant, London.

In the above draft, Thomas Lovell is the drawer; John Smith, Esq., is the drawee; and James Mills is the payee.

EXERCISE CCXXXIII.

1. Draw a note due in 3 months with interest at 6% per ann., (1) payable to John Smith or bearer, (2) payable to John Smith or order, (3) payable to John Smith.

2. Draw a note payable on demand.

3. Write a note for the following:—Face $250; time 3 mo.; interest 4% per ann.; maker James Jones; payee Thomas Harris.

4. Write a note payable at a bank for the following:—Face $50; time 3 mo.; interest 5% per ann.; maker Thomas Jones, payee Wm. Meadows.

5. What is the cost of a sight draft in Montreal for $750, at $\frac{1}{4}$% premium?

6. What is the face of a draft which can be purchased for $1500, at 1% premium?

7. Suppose that Porter & Jones of Montreal, owe you $350. Write out a sight draft on them for that sum in favor of the Bank of Commerce.

EXERCISE CCXXXIV.

Find (1) the day of maturity, (2) the term of discount, and (3) the proceeds of the following:—

	Date of Note.	Face of Note.	Time.	Discounted.	Rate.
1.	April 17, 1899	$657	3 mo.	May 1	8 %.
2.	Oct. 20, 1899	$803	4 mo.	Dec. 15	7 %.
3.	Sept. 15, 1899	$182.50	6 mo.	Dec. 28	5 %.
4.	May 11, 1899	$5621	4 mo.	July 31	6 %.
5.	Aug. 23, 1899	$511	90 da.	Oct. 25	5½%.
6.	June 20, 1899	$116.80	60 da.	June 28	7½%.

7. Find the face of a note which will realize $318.50 when discounted 4 mo. before maturity at 6%.

8. Mr. Jones has a bill for $568.80 to pay. He gives his note for 3 mo. which discounted at 5% on the day of making just produces this sum. Find the face of the note.

9. Find the proceeds of the following notes:—

$\$1962\frac{45}{100}$. Toronto, July 26, 1899.

Four months after date I promise to pay to the order of James Gillis one thousand nine hundred and sixty-two $\frac{45}{100}$ dollars at the Ontario Bank, for value received.

Discounted Aug. 26, at 7%. JOHN DEMAREST.

10.

$\$1066\frac{74}{100}$. Winnipeg, April 19, 1899.

Ninety days after date we promise to pay to the order of King & Dodge one thousand and sixty-six $\frac{75}{100}$ dollars at the Dominion Bank, for value received. CASE & SONS.

Discounted May 8, at 6%.

IX. STOCKS AND DIVIDENDS.

An Incorporated Company is a number of persons empowered by law to act as a single individual.

Stock is the capital of an incorporated company or the money borrowed by a government.

A Share is one of the equal parts into which stock is divided. Sometimes the share is $200, or $100, or $50, etc. Any sum may be agreed upon. When the price is quoted it is always on the basis of $100 of stock.

A Certificate of Stock is a statement showing that the party therein named owns a certain number of shares of the capital.

The Par Value of stock is the value named on the face of the certificate.

The Market Value of stock at any time is what it can be bought or sold for at that time.

Stock is at a **Premium,** or **Above Par,** when the market value is greater than the par value. It is at a **Discount,** or **Below Par,** when the market value is less than the par value.

Dividends are the profits from the business of companies distributed from time to time among the stockholders as percentages upon the par value of the stock.

A Bond is an obligation to pay a sum of money at a certain time with interest at a fixed rate at stated periods.

EXERCISE CCXXXV.

Find the value of the following:—

1. $7600 stock in the 4 per cents. at 103.
2. $5200 Bank of Ontario stock at 130.
3. $4850 Bank of Commerce stock at 145.
4. $650 Standard Bank stock at 192.
5. $3400 stock at 78½.

	No. of shares.	Par value.	Selling price.
6.	25 shares Imperial Bank	$100	190.
7.	45 shares Bank of Commerce	$50	145.
8.	75 shares Dominion Bank	$50	260.
9.	40 shares Bank of Montreal	$200	255.
10.	20 shares Ontario Bank	$100	130.

EXERCISE CCXXXVI.

How much stock can be bought with

1. $588 in the 3 per cents. at 84?
2. $5300 in Imperial Bank stock at 212?
3. $3220 in C.P.R. stock at 92?
4. $5733 in Toronto Railway stock at 102⅜?
5. $5500 in War Eagle stock at 250?

How many shares of stock can be bought as follows?—

	Sum invested.	Per value of share.	Selling price.
6.	$650	$100	130
7.	$5200	$200	260
8.	$576	$50	192
9.	$588	$25	84
10.	$900	$40	150

EXERCISE CCXXXVII.

What income is made from investing as follows:—

1. $5200 in stock at 130, paying 5% dividend?
2. $5390 in stock at 269½, paying 12% dividend?

3. $3600 in stock at 144, paying 8% dividend?
4. $1350 in stock at 135, paying 10% dividend?
5. $2863 in stock at 102¼, paying 4% dividend?

What rate of interest is made by investing as follows:—

6. In British America stock at 125, paying 7% dividend?
7. In Dominion Bank stock at 270, paying 12% dividend?
8. In London Electric stock at 120, paying 6% dividend?
9. In Traders Bank stock at 112½, paying 6% dividend?

EXERCISE CCXXXVIII.

What sum must be invested to produce an income of

1. $350 from stock at 130, paying a 5% dividend?
2. $550 from stock at 242, paying a 10% dividend?
3. $560 from stock at 141¾, paying a 7% dividend?
4. $720 from stock at 173, paying an 8% dividend?
5. $660 from stock at 104½, paying a 6% dividend?

How many shares of stock must be bought to produce the following incomes:—

	Income.	Par value of stock.	Dividend.
6.	$360	50	12%?
7.	$5600	400	20%?
8.	$880	40	10%?
9.	$1500	50	6%.?

EXERCISE CCXXXIX.

1. I received $880 from a 5½ per cent. dividend. How much stock do I own?

2. I receive $279 as my share of a 4½% dividend. How many shares, at $50 each, do I own?

3. A lady receives $1260 dividend at 7%. Required the amount of stock she owns and the number of shares, valued at $25 each.

4. A owns 85 shares of railroad stock, at $100 a share, and receives a dividend of $680. What was the rate of dividend?

5. Find the rate of dividend paid by a railroad when a holder of 246 shares, at $100 a share, receives $1722.

6. Mr. Jones owns 25 shares, at $50 a share, and receives a half-yearly dividend of $43.75. What was the half-yearly rate?

7. A has 40 shares, $50 each, of stock in a bank, which declares a dividend of 5%. What is A's dividend?

8. How much income will be obtained annually by investing $8010 in 6% bonds, selling at 89?

9. Find the sum required for an investment in a 4% stock, at 98½, to produce an income of $200 a year.

EXERCISE CCXL.

1. If money is worth 7%, what ought a stock that regularly pays 8% a year to sell for?

2. What must be the price of a 5% stock in order that a buyer may receive 6% on his investment?

3. Money being worth 4$\frac{1}{2}$%, what ought to be paid for stock that regularly pays 12% per annum?

4. If an 8% stock is worth 150, what rate of interest will a purchaser receive on his money?

5. How much stock must be sold at 123, brokerage $\frac{1}{8}$, to produce $2949?

6. What must be paid for 40 shares of stock $25 a share, selling at 142$\frac{1}{2}$, brokerage $\frac{1}{8}$?

7. How many shares of stock, $50 a share, at 72$\frac{7}{8}$, $\frac{1}{8}$% brokerage being paid, can be bought for $1825?

8. What sum must be invested in 6 per cent. gas stock, at 84, to produce an annual income of $2100?

9. The security being equal, which is the better investment —5 per cent. stock at 125, or 4$\frac{1}{2}$ per cent. stock at 115?

10. A owns $5000 stock, which pays a dividend of 7%. How much must B invest in a stock which pays 6$\frac{1}{4}$% dividend so that his income may be $50 more than A's?

X. EQUATION OF PAYMENTS.

Equation of Payments is the process of finding the time at which several debts due at different times may be paid without loss of interest to either the debtor or the creditor.

The Equated Time is the time at which the several debts may be cancelled by one payment.

EXERCISE CCXLI.

1. The interest on $100 for 10 days is equal to the interest on what sum for 1 day? for 2 days? for 5 days?

2. The interest on $250 for 12 days is equal to the interest on what sum for 1 day? for 2 days? for 3 days? for 5 days? for 8 days? for 10 days?

3. A loaned me $600 for 10 days. For how long should I allow him the use of $375? of $1200? of $1500? of $3000?

4. I borrowed from B $200 for 4 months, $300 for 6 months, and $400 for 7 months. How long should I lend him $1800 to repay the favor?

5. I owe to A $500, payable in 6 months, and $400, due in 15 months. When may I pay the whole in one payment?

6. I owe to B $80, due in 2 da.; $60, due in 8 da.; $40, due in 10 da.; and $100, due in 12 da. Find the equated time of payment.

7. A debt of $200 is due in 60 da.; $50 is paid 12 da. before it is due, and $100 is paid 24 da. before it is due. When should the balance be paid?

8. A man bought a farm on Jan. 1st, 1900, and is to pay $600 cash, $600 in 2 mo., $800 in 6 mo., and $1000 in 12 mo. Find the equated time of payment.

9. On Jan. 1st, 1900, a man gave 3 notes, the first for $500, payable in 30 days; the second for $400, payable in 60 days; the third for $600, payable in 90 days. What was the average term of credit?

EXERCISE CCXLII.

1. Find the average term of credit for the following bills:—

(*a*) $100 due in 2 mo.	(*b*) $100 due in 1 mo.	(*c*) $700 due in 5 mo.
300 " 4 "	200 " 2 "	350 " 4 "
200 " 7 "	300 " 3 "	550 " 2 "
400 " 8 "	400 " 4 "	400 " 5 "

2. A grocer buys $400 worth of goods at 90 days, at the end of 60 days he pays $200. Find when the balance should be paid.

3. If I buy goods for $3200 and agree to pay $\frac{1}{2}$ in 3 months and the rest in 5 months, but afterwards decide to pay all in one sum. When should I pay it?

4. A note for $800 is to be paid as follows:—$\frac{1}{4}$ at once, $\frac{1}{2}$ in 6 months, and the balance in 8 months. When could it all be paid together?

5. What is the average date for paying three bills due as follows:—March 31st $400, April 30 $300, May 30th $200?

6. On Jan. 25th, 1899, a grocer sold goods for $1340, $\frac{1}{2}$ payable in 90 days; $\frac{1}{4}$ in 120 days, and the balance in 150 days. What was the equated date of payment?

7. I bought goods for $600; $\frac{1}{3}$ to be paid at once, $\frac{1}{4}$ in 4 months, and $\frac{5}{12}$ in 6 months. At what time may the whole be paid?

8. A owes a sum of money, of which $\frac{1}{6}$ is payable at 30 days, $\frac{1}{3}$ at 60 days, and the rest at 90 days. What is the equated time for the payment of the whole?

9. A man purchased real estate, and agreed to pay $\frac{1}{3}$ of the price in 3 months, $\frac{1}{4}$ in 8 months, and the remainder in 1 year. Wishing to cancel the whole obligation at a single payment, how long shall this payment be deferred?

CHAPTER X.

PARTNERSHIP.

Partnership is the association of two or more persons in business, with an agreement to share the profits and losses.

Partners are the persons associated in business.

The Association is called a **Company,** a **Firm,** or a **House.**

The **Capital** or **Stock** is the money or property invested in the business.

EXERCISE CCXLIII.

1. B and C gain in business $1050. B's stock was $1500 and C's $2000. What share of the gain should each get?

2. A and B are partners. A furnished $840, and B $1080 capital. Find the share of each of $432 profit.

3. A and B agreed to do a work for $260. A worked 27 days and B 25 days. How should the money be divided?

4. A, B and C rent a pasture field for $275. A puts in 17 horses, B 26 horses, and C 12 horses. What share of the rent should each pay?

5. A, B and C engage in business. A puts in $3600, B $1700, and C $4800, and they gain $2424. What share of the gain should each get?

6. A and B engage in business with a capital of $6000. At the end of the year, A gets $208 and B $272 gain. What was the capital of each?

7. A, B and C enter into partnership. A puts in $2325, B $3250, and C $4625. A gets $465 for his share of the gain. What should B and C receive respectively?

8. The capital of a firm consists of $40000, of which A contributes $14000, B $17000, and C the rest. Divide $5000 profits among them in proportion to the capital of each.

9. A, B, C and D form a partnership. The capital of each is $4500, $2300, $1900, and $1100 respectively. They lose $1568. What is A's share of the loss?

10. Divide $9282 among A, B, C and D, giving A 10% more than B, B 10% more than C, and C 10% more than D.

EXERCISE CCXLIV.

1. A and B hire a pasture for $40. A puts in 10 sheep for 7 weeks, B 30 sheep for 3 weeks. What part of the $40 ought each to pay?

2. A and B take a contract. A furnishes 19 men for 10 days, and B 20 men for 15 days. How should the contract price, $735, be divided?

3. A, B and C rent a field for 6 months for $100. A puts in 25 cows to pasture for 5 mo.; B, 35 cows for 3 mo.; and C, 45 cows for 6 mo. How much of the rent should each pay?

4. A, B and C form a partnership. A puts in $300 for 3 mo.; B, $350 for 6 mo.; and C, $330 for 12 mo. Divide $580 profits fairly among them.

5. A and B form a partnership. A puts in $4000, and two months after $3000 more. B puts in at first $5000, and three months after $2000 more. During the year they gain $1200. How should this be divided?

6. A and B engage in trade for a year. A puts in $5000, and 4 mo. after withdraws $2000. B puts in at first $2000, and 3 mo. after adds $4000 more. They gain $5200. How should this be divided?

7. A and B enter into partnership. A puts in $10500 and B $7500. Four months after, C joins with $13500. At the end of the year the profits are found to be 10% of the total capital invested. Find the share of each of this gain.

8. A began business with $2250, and was afterwards joined by B with $6750. At the end of the year, each received half of the profits. How many months before the end of the year did B join?

9. A and B form a partnership for a year, A putting in $3000 and B $1800. If A takes out $1000 at the end of 5 months, how much more must B put in at the end of 7 months to receive one-half of the profits at the end of the year?

10. Two contractors have finished a contract for which they are to receive $12500. A employed 50 men for 125 days of 12 hr. each, and B 40 men for 90 days of 10 hr. each. Divide the money between them properly.

11. A and B enter into partnership: A's capital is $2000; B's $3600; how much must A put in at the end of 8 mo. to entitle him to half of the year's gain?

12. C, D, and E dissolved partnership July 1, 1899, after 15 months' business. C at first put in $4500, and Dec. 1, 1898, $1500 more. D at first put in $5500, and decreased it to $4000 Feb. 1, 1899. E at first put in $3000, and increased it to $5000 April 1, 1899. What share had each of the profit, $4200?

CHAPTER XI.

INVOLUTION AND EVOLUTION.

I. INVOLUTION.

A **Power** of a number is the product obtained by taking the number *a number of times* as a *factor*.

Involution is the process of raising a number to a power.

The **Index** or **Exponent** of a power is a figure placed at the right and a little above the number *to show how many times it is used as a factor;* thus, 5^2, 2 is the exponent.

The Square of a number is the **product** obtained by using the number **twice** as a factor.

The Cube of a number is the **product** obtained by using the number **three** times as a factor.

$4 \times 4 = 4^2 = 16$, or, the 2nd power, or square of 4.
$4 \times 4 \times 4 = 4^3 = 64$, or, the 3rd power, or cube of 4.
$4 \times 4 \times 4 \times 4 = 4^4 = 256$, or, the 4th power of 4.
$4 \times 4 \times 4 \times 4 \times 4 = 4^5 = 1024$, or, the 5th power of 4.

EXERCISE CCXLV.

Write the following as powers and find their values:—

1. $2\times2\times2$ $\quad$ $2\times2\times2\times2$ $\quad$ $3\times3\times3\times3\times3$.
2. $5\times5\times5$ $\quad$ $5\times5\times5\times5$ $\quad$ $5\times5\times5\times5\times5$.
3. $\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$ $\quad$ $\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}$ $\quad$ $\frac{2}{5}\times\frac{2}{5}\times\frac{2}{5}\times\frac{2}{5}\times\frac{2}{5}$.
4. $2\frac{1}{2}\times2\frac{1}{2}$ $\quad$ $3\frac{1}{4}\times3\frac{1}{4}\times3\frac{1}{4}$ $\quad$ $4\frac{1}{3}\times4\frac{1}{3}\times4\frac{1}{3}\times4\frac{1}{3}$.
5. $.1\times.1\times.1$ $\quad$ $.03\times.03\times.03$ $\quad$ $.05\times.05\times.05\times.05$.
6. $.12\times.12\times.12$ $\quad$ $.15\times.15\times.15$ $\quad$ $2.5\times2.5\times2.5\times2.5$.

Write the factors of the following powers and find their products:—

7. 2^3 $\quad$ 3^4 $\quad$ 4^3.
8. $(\frac{2}{3})^2$ $\quad$ $(\frac{3}{4})^3$ $\quad$ $(\frac{4}{5})^4$.
9. $(.5)^3$ $\quad$ $(.05)^3$ $\quad$ $(.001)^5$.
10. $(2\frac{1}{4})^2$ $\quad$ $(3\frac{1}{4})^3$ $\quad$ $(5\frac{1}{4})^4$.

EXERCISE CCXLVI.

Square the following numbers:—

1. 19 45 36 93.
2. 101 504 906 708.
3. 75.6 46.8 97.5 7.96.
4. $\frac{1}{3}$ $\frac{4}{7}$ $\frac{5}{8}$ $\frac{7}{16}$.
5. $4\frac{1}{2}$ $7\frac{1}{8}$ $9\frac{1}{2}$ $12\frac{2}{3}$.

Cube the following numbers:—

6. 9 19 41 91.
7. 101 110 506 909.
8. 30.5 4.55 78.4 6.97.
9. $\frac{2}{3}$ $\frac{5}{16}$ $\frac{11}{12}$ $\frac{14}{15}$.
10. $2\frac{1}{2}$ $5\frac{1}{4}$ $3\frac{5}{6}$ $7\frac{2}{9}$.

EXERCISE CCXLVII.

Raise the following numbers to the powers indicated:—

1. 9^2 5^3 25^2 16^3.
2. $(.09)^2$ $(.15)^2$ $(2.5)^3$ $(.33)^3$.
3. $(\frac{3}{4})^3$ $(\frac{2}{3})^4$ $(2\frac{1}{2})^3$ $(3\frac{1}{4})^3$.

Find the value of

4. 45^2 24^3 38^4 $(\frac{12}{13})^2$.
5. $8^2 \times 8^3$ $7^4 \times 7^5$ $12^3 \times 12^5$ $(\frac{1}{2})^2 \times (\frac{1}{2})^3$.
6. $12^3 \div 12^2$ $8^4 \div 8^2$ $12^3 \div 2^3$ $9^4 \div 3^3$.
7. $10^4 \div 5^3$ $(2.5)^3 \div (.1)^3$ $(\frac{8}{15})^3 \div (\frac{2}{3})^3$ $(3.5)^3 \div (.5)^3$.

8. What power of a number is the product of the first power, the second power, and the third power?

9. If the fifth power of two be multiplied by the third power of two, find the resulting number.

10. What power is the square of the cube of the fourth power?

11. Of what number is 7009 one of the two equal factors?

12. Of what number is 5050 one of the three equal factors?

13. Find the number of which one of its four equal factors is .002.

14. Show that $36^2 = 2^4 \times 3^4$.

15. A field is 48 rods long and 32 rods wide. Find the area of a square with an equal perimeter.

II. SQUARE ROOT.

The Square Root of a number is one of its **two equal** factors, thus 6 is the square root of 36.

The square root of a number is indicated by the *radical sign* $\sqrt{\ }$, or by the fraction $\frac{1}{2}$ written above and to the right of the number.

EXERCISE CCXLVIII.

Find the square root of the following:—

1.	81	121	144	225.
2.	1369	3136	4096	6561.
3.	11664	98596	65536	277729.
4.	$\frac{25}{36}$	$\frac{121}{361}$	$\frac{256}{289}$	$\frac{1225}{5473}$.
5.	$\frac{1296}{1681}$	$\frac{1849}{9801}$	$\frac{6241}{10201}$	$\frac{7569}{10609}$.
6.	.01	.0025	.0009	.0841.
7.	.061009	.001225	.003364	.0256.

Find the value of the following:—

8. $(144)^{\frac{1}{2}}$ $\left(\frac{9}{49}\right)^{\frac{1}{2}}$ $\left(\frac{4}{9}\right)^{\frac{1}{2}} \times \left(\frac{169}{324}\right)^{\frac{1}{2}}$ $\sqrt{\frac{49}{81}} \times \sqrt{\frac{9}{196}}$

Find the following:—

9. $\sqrt{9.3025}$ $\sqrt{.010404}$ $\sqrt{.326041}$ $\sqrt{.0000316969}$.

Find correct to 3 decimal places the square root of

10. 5 .5 .9 .009.

EXERCISE CCXLIX.

1. Find the two equal factors of 240100.

2. What number must be multiplied by itself to produce $2450\frac{49}{196}$.

3. Resolve 10252804 into two equal factors.

4. The area of a square lawn is 576 sq. yd. What is the length of one side?

5. The area of a square is 40 acres. Find the length of one of the sides in yards.

6. How many rods long must the side of a square field be to contain 250 acres?

7. Find the side of a square equal in area to a rectangle whose sides are 544 ft. and 136 ft.

8. What will it cost to fence a square farm containing 160 acres at 25 ct. per rod?

9. The side of a square field is 96 rods long. Find the length of the side of a square containing $2\frac{1}{4}$ times as much.

10. A square lawn contains 11664 sq. yd. What will it cost to fence it at $.75 per yd.?

EXERCISE CCL.

1. A rectangular garden contains 1875 sq. yd., and it is 3 times as long as it is wide. Find its length and width.

2. A rectangular garden contains 2 acres, and it is 5 times as long as it is wide. Find its length and width in yards.

3. A square yard is divided into 576 equal squares. Find the length of a side of each.

4. A field is 12 rd. square. How long is the side of another square field containing 1 sq. rd. more than twice the first?

5. Find the number of rails, each 12 ft. long, required to build a straight fence 6 rails high round a square 10A. field, allowing the rails to overlap 1 ft.?

6. The area of a square field is $122\frac{1}{2}$ acres. A rectangular field containing the same area is 4 times as long as it is wide. Find the number of rods in the length of this field.

7. How many yards of fencing are required to enclose a square farm containing 832A. 105 sq. rd.?

8. A square bin has a capacity of 1800 cu. ft. and is 8 ft. deep. What is its length?

9. The side of a square field is 171 yd. long and of another square field 140 yd. long. Find the length of the side of a sq. field as large as both together.

10. The perimeter of one square is 3840 yd. and of another 6688 yd. Find the perimeter of a square equal in area to both of them.

III. CUBE ROOT.

The Cube Root of a number is one of its **three equal** factors; thus, 4 is the cube root of 64.

The cube root of a number is indicated by $\sqrt[3]{\ }$, or by the fraction $\frac{1}{3}$ written above and to the right of the number.

EXERCISE CCLI.

Resolve the following numbers into prime factors, and from these find their cube roots:—

1.	216	512	729	1728.
2.	3375	4096	5832	9261.
3.	15625	13824	21952	35937.
4.	42875	117649	166375	175616.

Extract the cube root of the following:—

5. 4913 12167 24389 50653.

6. 148877 205379 300763 357911.

7. 1030301 1367631 4826809 6751269.

8. $\frac{343}{2197}$ $\frac{729}{6859}$ $\frac{2744}{17576}$ $\frac{1331}{59319}$.

9. .001 .000216 1560.896 47832.147.

Find the cube root correct to 3 decimal places of

10. .8 .08 .008 5.

EXERCISE CCLII.

Find the following:—

1. $\sqrt[3]{15625}$ $\sqrt[3]{.015625}$ $\sqrt[3]{1.860867}$ $\sqrt[3]{1012.048064}$.

2. $(9261)^{\frac{1}{3}}$ $(813\frac{1}{27})^{\frac{1}{3}}$ $(373\frac{31}{125})^{\frac{1}{3}}$ $(480\frac{143}{216})^{\frac{1}{3}}$.

3. The product of three equal factors is 43986.977. Find the factors.

4. Required the number of square feet in one face of a cubical block whose contents are 405224 cu. ft.

5. What is the entire surface of a cube whose cubical contents are 912673 cubic ft.?

6. A cubical cistern holds 4913 cu. ft. How deep is it?

7. The edges of a rectangular solid are 160 in., 25 in., and 54 in. respectively. Find the edge of a cube of the same volume.

8. The contents of a cube are 97.336 cu. in. Find the edge of a cube that contains 8 times as much.

9. A rectangular block of stone with a square end is 8 times as long as it is wide and contains 27 cu. ft. Find its length.

10. The contents of two cubes are respectively 5359.375 and 5.359375 cu. in. Find the difference between the lengths of their edges.

11. Find the total length of the edges of a cube containing 50653 cu. inches.

12. What must be the edge of a cubical bin that shall contain as many bushels as a bin 10 ft. 5 in. long, 5 ft. 4 in. wide, and 2 ft. 3 in. deep?

13. The product of three numbers is 2304. The second is twice the first and the third is one-third of the second. Find the first number.

14. A rectangular room contains 13824 cu. ft. Its width is $\frac{2}{3}$ of its length and its height is $\frac{2}{3}$ of its width. Find its length.

CHAPTER XII.

MENSURATION.

A Triangle is a plane figure bounded by three straight lines.

An Equilateral Triangle is one which has its three sides equal to one another.

An Isosceles Triangle is one which has two sides equal to each other.

A Right Angled Triangle is one which has a right angle.

The Hypothenuse is the side of a right angled triangle, which is opposite to the right angle.

The Base and **the Perpendicular** of a right angled triangle are the sides that contain the right angle.

A Quadrilateral is a plane figure bounded by four straight lines.

A Parallelogram is a quadrilateral, the opposite sides of which are parallel.

A Trapezoid is a quadrilateral with only two sides parallel.

A Rhombus is a quadrilateral which has its four sides equal to one another.

A Trapezium is a quadrilateral, which has none of its sides parallel.

A Circle is a plane figure bounded by a curved line called the **circumference,** every point of which is equally distant from a point within called the **centre.**

The Diameter of a circle is a straight line passing through the centre and terminated both ways by the circumference.

The Radius of a circle is a straight line drawn from the centre to the circumference.

A Right Cylinder is a solid, bounded by two (circular) plane faces and a curved face, every part of which is the same distance from a straight line joining the centres of the plane faces.

A Right Pyramid is a solid, bounded by a plane face enclosed by three or more straight lines, called the base, and as many triangular plane faces as the base has sides.

A Right Cone is a solid, bounded by a circular plane face, called the base, and a curved face tapering from the circumference of the base to a point.

A Sphere is a solid, bounded by a curved face, every part of which is equally distant from a point within it called the centre.

EXERCISE CCLIII.

1. Find the area of a square whose side is 39 yd.

2. How many square feet are there in the surface of a table 7 ft. 8 in. long and 3 ft. 10 in. wide?

3. A rectangular grass plot 25 yd. by 20 yd. has a gravel walk 4 ft. wide round it. Find the area of the gravel walk.

4. The sides of a rectangular field are 525 ft. and 84 ft. Find the side of a square of the same area.

5. A rectangular field contains .78 A. It is 3 ch. 25 l. long. Find its width.

6. Find the area of each of the parallelograms, one of whose sides and the perpendicular distance between it and the opposite side are respectively as follows:—

   (*a*) Side 17 in., perpendicular 13½ in.
   (*b*) Side 3 ch., perpendicular 1 ch. 80 l.
   (*c*) Side 3 yd. 1 ft., perpendicular 2 ft. 8 in.

7. The parallel sides of a trapezoid are 48 in. and 56 in. long respectively, and the perpendicular distance between them is 1¼ ft. Express the area in sq. ft.

8. The base of a parallelogram is 75 rods long, and it contains 7½ acres. Find its width.

9. The area of a square field is 40 A. Find its side.

10. A grass plot in the form of a parallelogram is 125 ft. long and 36 ft. wide. Find the cost of levelling and sodding it at 10 ct. per sq. yd.

EXERCISE CCLIV.

1. Draw figures representing the following triangles, and find the area of each, the base and perpendicular upon the base from the opposite angle being respectively:—

(*a*) 24 ft. and 15 ft. 6 in.
(*b*) 21 yd. 1 ft. 10 in. and 3 yd. 10 in.
(*c*) 2750 l. and 380 l.
(*d*) 20 ch. and 365 l.

2. The area of a triangle is 875 sq. in. The length of the perpendicular from an angle to the opposite side is 35 in. Find the length of this side.

3. The area of a triangle is 34 sq. ft. 63 sq. in.; its base is 14 ft. 6 in. Find the perpendicular from the opposite angle upon the base.

4. A triangular field contains 1 a. 24 sq. per. The perpendicular from an angle to the side opposite it is 4 rd. long. How long is this side?

5. A B C D is a trapezium. The diagonal, AC, is 100 ft. long. The perpendiculars, from D and B upon AC, are 30 ft. and 56 ft. respectively. Find the area of the trapezium.

6. In 5, if the diagonal is 65 yd. and the two perpendiculars 27½ yd. and 38½ yd., find the area.

7. The longest diagonal of a quadrilateral is 49 yd. and the perpendiculars let fall on it from the remaining angles are 9 ft. 6 in. and 13 ft. 10 in. Find the area.

8. Draw the trapezoid A B C D, AB and CD being the parallel sides and being 48 yd. and 56 yd. long respectively. The perpendicular distance between them is 10 yd. 2 ft. Find the area of the trapezoid.

9. The parallel sides of a trapezoid are 19 ft. and 23 ft., and the altitude is 9⅔ ft. Find the area.

10. The area of a trapezoid is 1155 sq. ft. One of the parallel sides is 84 ft. long and it is 16½ ft. wide. Find the length of the other parallel side.

EXERCISE CCLV.

NOTE.—In the following examples $\pi = 3\frac{1}{7}$.

1. Find the circumference of circles whose diameters are 14 in.; 1 ft. 9 in.; 3 ft. 6 in.; 5 yd. 1 ft. 4 in.; 7 yd. 2 ft. 4 in.; 4 ch. 76 l.

2. Find the diameter of circles whose circumferences are 1 ft. 10 in.; 4 ft. 7 in.; 20 yd. 6 in.; 5 ch. 39 l.; 4 rd.; 12 rd. 1 ft. 10 in.

3. A boy can walk round a circle in 1 hr. 17 min. At the same rate, how long will he take to walk along the diameter?

4. Two bicycles have wheels 2 ft. 11 in. and 3 ft. 6 in. in diameter respectively. If they start from the same place, and each wheel has made 1000 revolutions, how far will one be ahead of the other?

5. A coach wheel turns 336 times in travelling one mile. Find the diameter of the wheel.

6. A locomotive is moving at the rate of 60 miles per hour. The diameter of the driving wheel is 4 ft. How many times does it turn in a second?

7. The radius of a circle is 8 ft. Find the perimeter of the semicircle.

8. To enclose a circular garden, there are required 528 yd. of wire fencing. How long is the radius of the garden?

9. The diagonal of a square is 4 ft. 1 in. Find the circumference of a circle circumscribed about the square.

10. The radius of a circle is 5 ft. 3 in. Find the length of an arc of 20°; of 30°; of 50°; of 60°; of 100°; and of 110°.

EXERCISE CCLVI.

1. Find the area of each of the following circles:—

Diameter, 35 in.; 42 in.; 70 in.; 84 in.; 105 in.
Circumference, 44 in.; 66 in.; 77 in.; 110 in.; 308 ft.
Radius, 7 in.; $3\frac{1}{2}$ ft.; 4 ft. 8 in.; 5 ft. 3 in.; 21 chains.

2. How many square yards of oilcloth will be required to cover a circular floor 17 ft. 6 in. across?

3. Find the circumference of a circle whose area is 3.85 acres.

4. The radius of a circle is 84 inches. Find the radius of another circle of half the area.

5. Two circles, the radius of each being 7 in., are placed on the surface of a circle whose radius is 14 in. Find the number of square inches not covered.

6. A cow tethered can feed over $2\frac{1}{2}$ acres of ground. How long is the rope by which she is tied?

7. A circular field contains exactly one acre. Find the length of the fence which encloses it.

8. Find the number of grass sods, each 15 in. by 12 in., that will cover a circular piece of ground 21 ft. in diameter.

9. A circle 18 in. in radius has one 34 in. in diameter inscribed within it. Find the area of the part of the large circle without the smaller one.

10. Find the cost of making a path 7 ft. wide round a circular pond whose perimeter is 352 yd. at $1 per sq. yd.

EXERCISE CCLVII.

1. Find the hypothenuse of each of the following right angled triangles whose base and perpendicular are respectively:—

(*a*) 13 ft., 84 ft. (*c*) 1632 ft., 574 ft.
(*b*) 408 ft., 506 ft. (*d*) 598 ft., 360 ft.

2. Find the bases of the following right angled triangles whose perpendicular and hypothenuse are respectively:—

(*a*) 46 yd., 530 yd. (*c*) 117 ft., 125 ft.
(*b*) 1456 ft., 1906 ft. (*d*) 270 yd., 306 yd.

3. Find the perpendicular of the following right angled triangles whose base and hypothenuse are respectively:—

(*a*) 650 ft., 794 ft. (*c*) 56 yd., 394 yd.
(*b*) 240 ft., 818 ft. (*d*) 272 ft., 353 ft.

4. A boy is 21 mi. due south from his home; he travels 20 mi. due west. How far is he then from home?

5. A ladder is 37 ft. long and leans against a building with its foot 12 ft. from the wall. How far from the ground will its top rest against the wall?

6. A garden in the form of a rectangle is 210 ft. long and 176 ft. wide. How far is it from any corner to the one diagonally opposite it?

7. How far is it from the diagonally opposite corners of a cube 12 in. long?

8. How far is it from the diagonally opposite corners of a box 8 ft. long, 6 ft. wide and 5 ft. deep?

9. A ladder 26 ft. long stands upright against a wall. How far must the bottom of it be pulled out so as to lower the top 2 ft.?

10. Find the cost of fencing a field in the form of a right angled triangle, its base being 105 yd. and the perpendicular 208 yd. long at 10 ct. per yd.

EXERCISE CCLVIII.

1. Find the volumes of the cubes whose dimensions are as follows: $4\frac{1}{2}$ in.; $3\frac{1}{4}$ in.; 2 ft. 5 in.; 1 yd. 1 ft. 1 in.

2. Find the surface of each cube in the last example.

3. A rectangular log is 18 ft. long, 18 in. broad, and 14 in. thick, find—(1) its volume, (2) its surface.

4. A block of marble is 10 ft. long, 5 ft. 3 in. broad, and $2\frac{1}{2}$ ft. thick. Find—(1) its volume, (2) its surface.

5. The surface of a cube is 2400 sq. in. Find—(1) the length of its side, (2) its volume.

6. How much will it cost to excavate the basement of a schoolhouse 27 ft. long, 20 ft. wide and $8\frac{1}{4}$ ft. deep at 25 ct. per cu. yd.

7. From the log, in example 3, 2½ cu. ft. are cut off. What length of log is left?

8. A room 11 ft. high is half as long again as it is wide, and its cubical space is 4768½ cu. ft. Find its length and breadth.

9. A gallon contains 277.274 cu. in. Find the length of a cubical box that holds 10 bushels.

10. A cubic foot of water weighs 1000 oz. and a gallon 10 lbs. How many gallons are there in a rectangular cistern 6 ft. long, 5½ ft. wide, and 8 ft. deep.

EXERCISE CCLIX.

1. Find the volume of each of the cylinders whose length and diameter are respectively:—

(*a*) 8 ft. and 14 in. (*c*) 10 ft. and 7 ft.
(*b*) 12 ft. and 3 ft. 6 in. (*d*) 20 ft. and 2 ft. 11 in.

2. Find the area of the curved surface of each of the cylinders in example 1.

3. A well is 15 ft. deep and its diameter is 3 ft. 6 in. How many cu. yd. of earth were taken out in digging it?

4. A circular shaft is 90 ft. deep and 3 ft. in diameter. Find the cost of sinking it at $2.80 per cu. yd.

5. Find the total surface of the cylinders in example 1.

6. How much curved heating surface is there in a steam pipe 1 in. in diameter and 350 ft. long?

7. A pillar 21 ft. high and 18 in. in diameter, supporting a building, is to be decorated at 25 ct. per sq. ft. Find the cost.

8. A cylinder contains 11 cu. ft. and is 14 ft. long. Find its diameter.

9. It costs $11.88 to paint the curved surface of a pillar 18 ft. high at 63 ct. per sq. yd. Find its diameter.

10. Find the number of cu. ft. of iron in a water pipe 12 ft. long and 2 ft. 6 in. in diameter, the iron being 2 in. thick.

EXERCISE CCLX.

1. A square pyramid is 16 ft. high, and each side of the base is 4 ft. 6 in. long. Find its volume.

2. A triangular pyramid is 12 in. high, and the sides of the base are 29 in., 52 in. and 69 in. Find its volume.

3. The slant height of a cone is 10 ft., and the circumference of the base is 15 ft. Find the area of the curved surface.

4. A cone is 3½ ft. in diameter. Its slant height is 6 ft. Find the area of the lateral surface.

5. The slant height of a conical spire is 45 ft. The circumference at the base is 30 ft. Find the cost of painting it at 45 ct. per sq. yd.

6. Find the volume of a cone 35 in. in diameter at the base and 60 in. in height.

7. A cone is 48 ft. high; its volume is 1386 cu. ft. Find—(1) the area of the base, (2) the circumference of the base.

8. How many yards of canvas $\frac{3}{4}$ yd. wide will be required for a conical tent 21 ft. in diameter and 15 ft. high?

9. What is the volume of the largest possible cone, cut out of a cubical block whose edge is 7 ft.

10. The radius of the base of a cone whose height is 5 ft. is 11 in. Find the slant height.

EXERCISE CCLXI.

1. Find the surface of each sphere of the following dimensions:—(*a*) Radius, $3\frac{1}{2}$ in.; (*b*) diameter, $3\frac{1}{2}$ in.; (*c*) circumference, 44 in.; (*d*) circumference, 88 in.

2. What will it cost to gild a globe 28 in. in radius at 36 ct. per sq. ft.?

3. The surface of a sphere contains 2464 sq. ft. Find its radius.

4. The surface of a sphere contains 5544 sq. ft. Find its circumference.

5. Find the volume of each sphere of the following dimensions:—(*a*) Radius, 6 in.; (*b*) radius, 12 in.; (*c*) diameter, 14 in.; (*d*) circumference, 22 in.

6. Find the volume of a sphere whose surface is 1386 sq. ft.

7. A cubical block of wood 3 ft. long is formed into the largest globe possible. How much wood is cut away?

8. A solid metal sphere 6 in. in diameter is melted and formed without loss into a cylinder 3 in. in radius. How long is the cylinder?

9. A solid metal sphere 12 in. in diameter is melted and formed without loss into shot $\frac{1}{4}$ in. in diameter. How many shot are there?

10. How many balls $\frac{1}{2}$ in. in diameter can be made from a cubic block of lead $5\frac{1}{2}$ in. long?

MISCELLANEOUS EXERCISES.

EXERCISE CCLXII.

1. Each equal side of an isosceles triangle measures twice as much as the base. If the base is 48 ft. long, find the altitude.

2. Find the base of a triangle whose area is 5280 sq. yd. and height 120 yd.

3. The perimeter of an isosceles triangle is 153 yd. and each of the equal sides is $\frac{5}{8}$ of the 3rd. Find (1) the base, (2) the area.

4. Two sides of a triangle are 218 ft. and 241 ft. long and the perpendicular from the included angle upon the 3rd side is 120 ft. Find the 3rd side.

5. The top of a pole is broken off and strikes the ground 15 ft. from the foot of the pole. Find the whole length of the pole supposing the broken piece to be 39 ft.

6. Find the area of an equilateral triangle whose side is 10 ft.

7. A stick 4 ft. long placed upright in the ground is found to cast a shadow 4 ft. 9 in. long. What is the height of a pole that casts a shadow 38 ft. long?

8. A foot path goes along two adjacent sides of a rectangle. One side is 196 yd. and the other 147 yd. long. Find the saving in distance by going along the diagonal instead of the sides.

9. The perimeter of a square is 748 in. and of another is 336 in. Find the perimeter of another equal in area to the other two.

10. There are two rectangular fields of equal area. The adjacent sides of one are 945 yd. and 1344 yd. long. The longer side of the other is 1134 yd. long. Find the shorter side.

EXERCISE CCLXIII.

1. How long is the edge of a cube whose surface is 11094 sq. ft.?

2. A triangular field contains one acre. A perpendicular drawn from one corner to the side opposite measures 40 yd. Find this side.

3. The volume of a cube is 37 cu. ft. 64 cu. in. Find the cost of painting it at 33⅓ ct. per sq. ft.

4. A has two circular plots of ground 100 ft. and 20 ft. in diameter, respectively. How many times is one as large as the other?

5. What must be the circumference of a circular lake which shall contain $\frac{1}{16}$ part as much surface as a circular lake 13½ miles in circumference?

6. What is the distance through the opposite corners of a square yard?

7. Find the perimeter of a rectangular plot of land whose length is 2½ times its width, if it contains 6¼ acres.

8. A ladder 20 ft. long reaches to the top of a wall when the foot is 13 ft. from the wall. How much does the ladder project above the wall, when its foot is 5 ft. from the wall.

9. If a c. ft. of marble weighs 2.716 times as much as a cu. ft. of water. Find the weight of a rectangular block of marble 9½ ft. by 2½ ft. by 2 ft. (A cu. foot of water weighs 1000 oz.)

10. The sides of a triangular field are 350 yd., 440 yd. and 750 yd. in length. It rents for $31.50 per annum. Find the rent per acre.

EXERCISE CCLXIV.

1. The perimeter of a semicircle is 36 ft. Find the length of the diameter.

2. Which will carry the largest amount of water two 3 in. tile or one 4 in. tile, the speed being the same in each case?

3. Find the diameter of a circle equal in area to a rectangle whose sides are 154 ft. by 81 ft.

4. A circular pond 52 ft. in diameter has a walk 4 ft. wide round it. Find the area of the walk.

5. A tower 154 ft. high stands in the middle of a stream 144 ft. wide. How long is the distance from the shore to the foot of the flag staff upon the top of the tower.

6. Find the area of a trapezoid whose parallel sides are 178 ft. and 146 ft. and the perpendicular distance between them 87½ ft.

7. Find the area of a pond whose circumference is 264 ft.

8. A B C D is a quadrilateral figure. AB is 400 ft. long, BC 203 ft., CD 396 ft., DA 195 ft. The angles at A and C are right angles. Draw the figure and find its area.

9. A trapezium is divided into two triangles by a diagonal 40 ft. long. The difference in length of the perpendiculars from the opposite angles on the diagonal is 7 ft. Find the difference in area of the triangles?

10. The difference between the circumference and the diameter of a circle is 45 in. Find the area of the circle.

EXERCISE CCLXV.

1. ABCD is a trapezoid. AD and BC are the parallel sides and are 32 ft. and 40 ft. long, respectively. AB is 16 ft. long and CD 18 ft. BA and CD are produced to meet in E. Find the length of EB and EC respectively.

2. Find the area of a quadrilateral field whose diagonal is 40 rods and the perpendiculars on this diagonal from the opposite angles 14 rods and 26 rods, respectively.

3. Find the area of a trapezium whose diagonal is 168 ft. long, one perpendicular on the diagonal from the opposite angle being 42 ft. long, the other, 56 ft. long.

4. The area of a circle is 44 sq. ft. Find the difference between the areas of the circumscribed and inscribed squares.

5. The side of a square field is 40 rods long. Find the length of the side of a square field that contains (1) 4 times as much land; (2) 9 times as much; (3) 5 times as much.

6. The perimeter of a rectangle is 164 in. and the difference in length of the two adjacent sides is 22 in. Find the area of the rectangle.

7. The base of a triangle is 57 ft. long and the difference in length of the other two sides is 3 ft. The distance between the middle of the base and the perdendicular let fall from the vertical angle on the base is 3½ ft. Find (1) the other sides of the triangle, (2) the length of the perpendicular.

8. The height of a tower on a river bank is 154 ft. The length of a line from the top of the tower to the opposite bank is 170 ft. Find the breadth of the stream.

9. Find the surfaces of the cubes whose contents are 9261 cu. in. and 19683 c. in. respectively.

10. A man has a circular lawn 75 ft. in diameter. What is the length of a string that as radius would describe a circle containing 9 times as much ground?

EXERCISE CCLXVI.

1. A circular garden contains 246400 sq. ft. A pole placed in the centre of the garden is broken and the top just reaches the edge of the garden. Find the height of the piece still standing, the length of the broken part being 287 feet.

2. A cylinder is 14 ft. long and 7 ft. in diameter. Find (1) the area of the curved surface and (2) the area of the entire surface.

3. What is the length of a stone wall that will enclose an acre of land in the form of a circle?

4. How many men can stand on an acre of land allowing 12 sq. ft. to each?

5. What length of wire without loss of metal may be drawn from a globe 6 in. in diameter, the diameter of the wire being $\frac{1}{20}$ of an in.?

6. The area of a rectangular field is 5 acres and the fence that encloses it is 120 rods long. Find the length of the sides of the field.

7. A stick of square timber 24 ft. long contains 90 c. ft. What must have been the diameter of the tree from which it was hewn?

8. A square tank holding 4500 gal. of water is 5 ft. deep. Find its length.

9. What is the cost of lining a water-cistern 3 ft. long, 2 ft. deep and 2 ft. 6 in. broad, with sheet lead of 10 lb. per square foot at $9.60 per cwt., there being no lid.

10. What is the cost of painting a conical spire whose slant height is 120 ft. and circumference at the base 60 ft., at 8 c. per sq. yd.?

EXERCISE CCLXVII.

1. Three squares contain respectively 36, 64, and 576 sq. ft. Find the length of a side of that square which has an area equal to four times their sum.

2. What is the length of a perpendicular let fall from any angle of an equilateral triangle to its opposite side when this side is 12 yd. long?

3. How many chains are there in the side of a field in the form of an equilateral triangle, containing 24 acres?

4. The length of a rectangle is 12 chains. What is its breadth to contain 4 acres?

5. The sides of a rectangle are 77 yd. and 32 yd. What is the diameter of a circle of equal area?

6. The base and perpendicular of a right angled triangle are 44 ft. and 63 ft. respectively. Find the diameter of a circle of equal area.

7. The base and perpendicular of a right angled triangle are respectively, 308 ft. and 875 ft. long. Find the diameter of a circle equal in area to the triangle.

8. The side of a square is 15 ft. long. What is the length of the diameter of the circumscribed circle?

9. The length of a stick of timber is 24 ft.; its breadth is 3 ft. and its thickness 2 ft. 9 in. Find the area of the entire surface.

10. Find the volume of a cylinder 21 inches in diameter and 20 ft. in length.

EXERCISE CCLXVIII.

1. Find the area of the surface of a sphere $3\frac{1}{2}$ ft. in diameter.

2. The side of a cubical box is 20 in. long. Find the length of its diagonal.

3. The volume of a cube is 4096 cu. in. Find the length of its diagonal.

4. A room 18 ft. high is quarter as long again as it is wide and its cubical contents are 20250 cu. ft. Find its length and breadth.

5. Find the weight of a metal disc 7 ft. in diameter, and $1\frac{1}{8}$ ft. thick, if a cubic foot of this metal weighs $37\frac{1}{2}$ lb.

6. How many planks each $13\frac{1}{2}$ ft. long and $10\frac{1}{2}$ in. wide will cover a platform 54 yd. long and 21 yd. wide?

7. A circular plate of lead 2 in. in thickness and 8 in. in diameter is converted without loss into spherical shot each of .05 in. in radius. How many shot does it make?

8. If a cube of lead the edge of which is 1 in. long weighs 9 oz., find the weight of a cube of lead whose edge is 3 in. long.

9. A solid sphere of iron 12 in. in diameter is melted and cast into a hollow cylinder 7 in. in radius. How long is the cylinder, the iron being 2 in. thick.

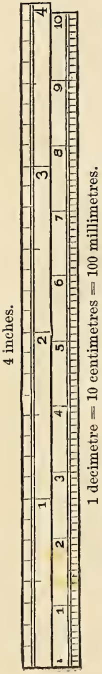
10. A sphere 5 in. in diameter weighs 75 oz. Find the weight of a sphere 4 in. in diameter made of material 25% heavier than the other.

CHAPTER XIII.

THE METRIC SYSTEM OF WEIGHTS AND MEASURES.

The Metric System of Weights and Measures is based upon the decimal scale of notation.

It is used in scientific treatises, and has been adopted by most of the nations of Europe and South America.



Its advantages are:—

(1) It is easily applied. All the operations are the same as in simple numbers.

(2) It does away with Reduction, Addition, Subtraction, Multiplication and Division of Compound Numbers.

(3) Its general introduction would greatly facilitate commerce and exchange, giving all nations a universal system of weights and measures.

The fundamental Unit is the **Metre.** From this all the other units of the system are derived, hence the name **Metric System.**

The principal units of the system are as follows:—

The unit of **Length** is the **Metre,** which is 39.37 inches.

The unit of **Capacity** is the **Litre,** which is .2201 gallons.

The unit of **Weight** is the **Gram,** which is 15.43 grains.

The unit of **Surface** is the **Are,** which is 119.6 sq. yd.

The Metric System is entirely decimal. The submultiples and multiples of the unit are denoted by the following prefixes:—

$$\left.\begin{array}{lcl}\text{Milli} & = & .001\\ \text{Centi} & = & .01\\ \text{Deci} & = & .1\\ \text{Deka} & = & 10.\\ \text{Hecto} & = & 100.\\ \text{Kilo} & = & 1000.\\ \text{Myria} & = & 10000.\end{array}\right\}\text{times, }\left\{\begin{array}{l}\text{a metre.}\\ \text{a litre.}\\ \text{a gram.}\\ \text{an are.}\end{array}\right.$$

LINEAR MEASURE.

10 millimetres	(mm.)	= 1 centimetre	=	.01	metre.
10 centimetres	(cm.)	= 1 decimetre	=	.1	"
10 decimetres	(dm.)	= 1 metre	=	1.	"
10 metres	(m.)	= 1 dekametre	=	10.	"
10 dekametres	(Dm.)	= 1 hectometre	=	100.	"
10 hectometres	(Hm.)	= 1 kilometre	=	1000.	"
10 kilometres	(Km.)	= 1 myriametre	=	10000.	"

NOTE.—1 metre = 39⅜ in. nearly; 70 yd. = 64 metres nearly. 1 kilometre = 1100 yd. nearly; 8 km. = 5 mi. nearly.

EXERCISE CCLXIX.

1. Read the following:—37.5 m.; 12.7 cm.; 48.3 mm., 7.865 Dm.; 9.7 dm.

2. Express 4560 mm.—(1) as centimetres, (2) as decimetres, (3) as metres.

3. Express 1.87 Dm.—(1) as metres, (2) as millimetres, (3) as centimetres.

4. Simplify .789 m. + 78.9 cm. + 7856 mm. + 1897 Km.

5. Simplify .845 Km. — 6457 cm.; 6.59 cm. — 54.87 mm.

6. Simplify 768.4 cm. × 12; 3.7896 dm. × 789.5.

7. A book is 3.2 cm. thick. If the average thickness of the leaves is .05 mm., find the number of leaves in the book.

8. The circumference of a wheel is 6.3 m. in length. How often will such a wheel turn in going 173.88 Km.?

9. Find the cost of 27.84 m. of cloth at $2.75 per metre.

10. The Mont Cenis tunnel is about 12.22 Km. long. How many miles is this?

11. Find the cost of building a railroad 37 Km. 47 m. long at $15000 a kilometre.

12. How often will a bicycle wheel 225 cm. in circumference turn in going from Toronto to Hamilton a distance of 63 Km.?

SQUARE OR SURFACE MEASURE.

100 sq. millimetres (sq. mm.)=1 sq. centimetre= .0001 sq. metre.
100 sq. centimetres (sq. cm.)=1 sq. decimetre = .01 "
100 sq. decimetres (sq. dm.)=1 sq. metre = 1. " =1 centare.
100 sq. metres (sq. m.)=1 sq. dekametre = 100. " =1 are.
100 sq. dekametres (sq. Dm.)=1 sq. hectometre = 10000. " =1 hectare.
100 sq. hectometres (sq. Hm.)=1 sq. kilometre =1000000. "

NOTE.—The are, centare and hectare are used only in land measure.

The are is slightly less than 4 sq. rods.

The hectare is slightly less than 2½ acres.

EXERCISE CCLXX.

1. Convert 2876345 sq. m. into hectares.
2. How many ares are there in 3.7856 sq. Km.?
3. Write 5.7536 sq. m. as sq. centimetres; as sq. millimetres.
4. How many sq. metres are there in 2.3417 sq. Km.?
5. How many sq. centimetres are there in .0542 sq. m.?
6. Write as one quantity in sq. metres 3 sq. Km. + 3 sq. Hm. + 3 sq. Dm. + 3 sq. m.
7. How many ares are there in a rectangle 200 metres long and 56 metres wide?
8. How many sq. metres are there in a rectangular floor 6.8 m. long and 4.8 m. wide?
9. What will be the cost of 5 sq. m. of sheet tin at 5 mills a sq. decimetre?
10. How many bricks, each 20 cm. long and 10 cm. wide, will be required to pave a sidewalk 3.3 m. wide and 1.7 Km. long?

MEASURES OF CAPACITY.

1000 cu. millimetres (c. mm.)=1 cu. centimetre= .000001 cu. metre.
1000 cu. centimetres (c. cm.)=1 cu. decimetre = .001 " =1 litre.
1000 cu. decimetres (c. dm.)=1 cu. metre =1. " =1 stere.

NOTE.—In measuring wood a cubic metre, called a **stere** (st.), is used; $3\frac{7}{10}$ steres = 1 cord nearly.

In measuring liquids the cubic decimetre, called a **litre,** is used.

In measuring grains, fruits, etc., the hectolitre is used.

The numeral prefixes are used with the litre as with the metre.

EXERCISE CCLXXI.

1. How many steres of wood are there in a pile 29 m. long, 1.25 m. wide, and 2 m. high?
2. What will 17.3 Hl. of wheat cost at $0.25 a dekalitre?

3. How many litres are there in a rectangular tank 4.3 m. long, 3.75 m. wide, and 1.6 m. deep?

4. How many cubic metres are there in a wall 25 m. long, 3.4 m. high, and 275 mm. thick?

5. What must be the depth of a rectangular bin 12 m. long and 8 m. wide in order to contain 2500 Hl. of grain?

6. How many cubic metres are there in a rectangular box 125 cm. long, 112 cm. wide, and 100 cm. deep?

7. How deep must a rectangular box be to hold 30 l. if it is 50 cm. long and 20 cm. wide?

8. How many hektolitres will a rectangular bin 5 m. long, 3 m. wide and 2 m. deep hold?

9. At $0.75 a cu. m., what will be the cost of digging a cellar 13.3 m. long, 11.5 m. wide and 2.4 m. deep?

10. If 4.25 Hl. of oats cost $6.80, what will be the cost of 5 l.?

MEASURES OF WEIGHT.

10 milligrams (mg.) = 1 centigram = .01 gram.
10 centigrams (cg.) = 1 decigram = .1 "
10 decigrams (dg.) = 1 gram = 1. "
10 grams (g.) = 1 dekagram = 10. "
10 dekagrams (Dg.) = 1 hektogram = 100. "
10 hektograms (Hg.) = 1 kilogram = 1000. "

NOTE.—**A cubic centimetre** of water at its greatest density weighs one **gram.**

A gram = 15½ grains nearly; 28 grams = 1 oz. Avoir. nearly.

A kilogram = 2⅕ lb. Avoir. nearly.

1000 kilograms = 22 cwt. = 1 tonneau or metric ton.

A litre of water weighs 1 kilogram.

A cubic metre of water weighs 1000 kilograms.

EXERCISE CCLXXII.

1. Write 5 Kg. 3 Dg. and 7 g. as grams.; as dekagrams.

2. Write 3 g. 7 cg. and 5 mg. as milligrams.; as decigrams.

3. Write 8 myriagrams, 7 hectograms, 6 centigrams and 5 milligrams as grams.; as centigrams.

4. Express 2756 g. as kilograms; as centigrams.

5. What is the capacity of a bottle which weighs 560 g. when empty and 7.84 Kg. when full of water?

6. At $0.75 a kilogram, find the cost of a metric ton of coffee.

7. What weight of water will fill a vat 84 cm. long, 75 cm. wide and 42 cm. deep?

8. What is the cost of .67225 Kg. of opium at 62½ ct. per gram.?

9. Give the weight in milligrams of a pill when a mass weighing 21.7 g. is made into 70 pills.

10. What decimal is 5 g. 4 cg. of one kilogram?

EXERCISE CCLXXIII.

Write the following:—

1. (*a*) Write 7 dekametres, 2 decimetres and 5 centimetres as metres.

(*b*) Write 8 hectolitres, 8 litres and 7 decilitres as litres.

(*c*) Write 15 ares, 9 deciares and 8 milliares as ares.

(*d*) Write 27 kilograms, 3 decigrams and 7 centigrams as grams.

2. Mercury weighs 13.5 times as much as water. Find the weight of 44 litres of mercury.

3. Marble weighs 2.7 times as much as water. Find the weight of a rectangular block of marble 2.5 m. long, 1.75 m. wide, and 4 m. thick.

4. If silver weighs 10.5 times as much as water, how many coins, each weighing 5 grams, can be coined from a cubic decimetre of silver?

5. If alcohol is 80% as heavy as water, find the weight of 485 c.cm. of alcohol.

6. How many steres of wood are there in a pile 50 m. long, 1.1 m. wide, and 2 m. high?

7. What is the profit on 75 hectolitres of potatoes, bought at 7 francs a hectolitre, and retailed at 1 franc a dekalitre?

8. How many hectolitres of apples, at $1.25 a hectolitre, should be given for 5 dekasteres 5 steres of wood at 75 ct. per stere?

9. A druggist having .75 Kg. of quinine makes up 500 pills containing 2 decigrams of quinine each. How many grams has he left?

10. A farmer, having 4 hectometres of wire fence, uses a portion of it to enclose a field 50 metres square. How many metres has he left?

11. What will be the profit on 10 g. of calomel, bought for 50 ct., if sold in powders of 5 dg. at 5 ct. each.

12. A train runs 47.5 Km. per hour. How many miles does it go in 6 hr. 24 min.

13. How often can a cup, holding 3 cl., be filled from a vessel containing 14.31 l. of water?

14. How many rolls of wall paper, 10 m. long and .5 m wide, are needed to paper the walls of a room, 6.3 m. long, 4.2 m. wide and 3.2 m. high?

CHAPTER XIV.

MISCELLANEOUS EXERCISES.

I. CIRCULATING DECIMALS.

Decimals may be classified into **Finite,** or **Terminating Decimals,** and **Infinite, Circulating** or **Recurring Decimals.**

A Terminating Decimal is one which extends to a limited number of places from the Decimal point, as .375, .0024.

A Circulating Decimal is one in which the same figure, or set of figures, continually recurs in the same order, as .3333 . . ., .456456456 . . .

The Repetend is the figure or set of figures which recurs.

A repetend is expressed by writing a dot over the figure repeated, or, if more than one figure is repeated, by writing a dot over the first and the last figure of the repetend, as $.\dot{3}$, $.\dot{4}5\dot{6}$, $.234\dot{7}\dot{8}$.

Circulating Decimals are subdivided in **Pure** and **Mixed Circulating Decimals.**

A Pure Circulating Decimal is one in which the figures begin to repeat from the decimal point, as $.\dot{3}$, $.\dot{4}\dot{5}$.

A Mixed Circulating Decimal is one in which the figures do not begin to repeat from the decimal point, as $.6\dot{4}$, $.45\dot{3}7\dot{5}$.

EXERCISE CCLXXIV.

Reduce the following fractions to circulating decimals:—

1. $\frac{1}{3}$ $\frac{5}{11}$ $\frac{32}{33}$ $\frac{85}{111}$.
2. $\frac{4}{9}$ $\frac{1}{7}$ $\frac{2}{7}$ $\frac{3}{7}$.

3. $\frac{4}{7}$ $\frac{5}{7}$ $\frac{6}{7}$ $\frac{1}{13}$.
4. $\frac{3}{13}$ $\frac{5}{13}$ $\frac{9}{13}$ $\frac{7}{11}$.
5. $\frac{5}{6}$ $\frac{7}{12}$ $\frac{41}{44}$ $\frac{13}{14}$.
6. $\frac{33}{35}$ $\frac{21}{22}$ $\frac{25}{28}$ $\frac{71}{444}$.
7. $\frac{17}{24}$ $\frac{47}{112}$ $\frac{79}{144}$ $\frac{29}{176}$.
8. $\frac{23}{52}$ $\frac{75}{104}$ $\frac{49}{352}$ $\frac{8}{21}$.
9. $\frac{17}{84}$ $\frac{459}{555}$ $\frac{125}{888}$ $\frac{897}{1776}$.
10. $\frac{49}{288}$ $\frac{967}{1408}$ $\frac{79}{224}$ $\frac{277}{1375}$.

EXERCISE CCLXXV.

Reduce the following to vulgar fractions in their lowest terms:—

1. $.\dot{5}$ $.\dot{1}\dot{7}$ $.\dot{3}\dot{6}$ $.\dot{2}1\dot{6}$.
2. $.\dot{0}1\dot{8}$ $.\dot{0}2\dot{7}$ $.\dot{0}0\dot{9}$ $.\dot{1}4\dot{4}$.
3. $.\dot{0}5\dot{4}$ $.\dot{3}2\dot{4}$ $.\dot{3}7\dot{0}$ $.\dot{2}9\dot{6}$.
4. $.\dot{9}4\dot{5}$ $.\dot{4}2\dot{3}$ $.\dot{7}8\dot{3}$ $.\dot{2}6\dot{1}$.
5. $.\dot{9}80\dot{1}$ $.\dot{9}2307\dot{6}$ $.\dot{1}4285\dot{7}$ $.\dot{2}8571\dot{4}$.
6. $.9\dot{5}\dot{4}$ $.52\dot{7}$ $.3\dot{8}\dot{1}$ $.\dot{2}439\dot{0}$.
7. $.7\dot{8}5\dot{2}$ $.10\dot{3}\dot{6}$ $.01\dot{6}\dot{9}$ $.013\dot{6}$.
8. $.65\dot{9}\dot{0}$ $.00\dot{6}7\dot{5}$ $.24\dot{3}7\dot{0}$ $.3\dot{8}5714\dot{2}$.
9. $.79\dot{5}\dot{4}$ $.04\dot{6}4\dot{8}$ $2.\dot{2}9\dot{7}$ $7.\dot{6}7\dot{5}$.
10. $4.00\dot{6}$ $5.0\dot{0}\dot{6}$ $7.\dot{0}0\dot{6}$ $5.2\dot{7}$.

EXERCISE CCLXXVI.

Simplify the following:—

1. $.\dot{2}\dot{3} + .2\dot{3}\dot{4} + .23\dot{4}\dot{5} + 5.\dot{7} + .123\dot{4}\dot{5}$.
2. $.1\dot{6} + .\dot{7}9\dot{2} + .2\dot{1}43\dot{1} + .\dot{5}\dot{6} + .5\dot{6}$.
3. $25.12\dot{3} - 15.\dot{6}\dot{3}$; $19.\dot{1}0\dot{7} - 5.0\dot{4}\dot{3}$.
4. $.\dot{5}7\dot{4} - .25$; $.574 - .\dot{2}\dot{5}$.
5. $.75\dot{4} + .2\dot{1}\dot{3} - .68\dot{4}\dot{7} + .4\dot{5}6\dot{1} - .00\dot{6}$.
6. $.\dot{6}\dot{3} \times 2.5$; $2.\dot{1}\dot{5} \times 3.\dot{2}0\dot{4}$.
7. $.4\dot{6} \times .\dot{7}\dot{2}$; $.75 \times .\dot{7}\dot{5} \times .7\dot{5}$.
8. $.33\dot{9} \div .\dot{7}\dot{2}$; $.\dot{8}\dot{1} \div 2.\dot{3}$.
9. $2.7\dot{3}\dot{6} \div 4.3$; $51.\dot{8}\dot{1} \div 5.\dot{1}\dot{8}$.
10. $4\cdot3\dot{7} \times .27 \div 2.\dot{1}\dot{8}$; $.\dot{1}5\dot{4} \div \dot{2} \times 11.\dot{2}\dot{5}$.

EXERCISE CCLXXVII.

1. The product of $.\dot{9}$, $.1\dot{9}$ and a third factor is $2.\dot{1}$. Find the third factor.

2. What must be multiplied by $.\dot{8}0952\dot{3}$ to produce $.\dot{3}\dot{4}$?

3. Without dividing, write the decimals equivalent to $\frac{71}{1000}$, $\frac{71}{999}$, $\frac{71}{990}$, $\frac{71}{900}$, $\frac{71}{9900}$, $\frac{71}{9000}$, $\frac{71}{9999}$.

4. What two numbers are those the sum of which is $.1\dot{9}\dot{4}$ and the greater exceeds the less by $.1\dot{2}\dot{8}$?

5. Without dividing, state what kind of decimal each of the following are equivalent to:—$\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{11}$, $\frac{5}{8}$, $\frac{7}{12}$, $\frac{7}{9}$, $\frac{5}{44}$, $\frac{3}{7}$.

6. Simplify $.6\dot{5}1\dot{8} \div .14\dot{6} \times .225 + 5 \div .1\dot{5}$.

7. Simplify $.\dot{7}$ of £3 + $.2\dot{1}$ of 5s. + $.\dot{3}\dot{6}$ of 11d.

8. Simplify $.3\dot{8}$ of 9 t. + $.1\dot{4}\dot{4}$ of 37 lb. — $.\dot{4}\dot{5}$ of 3 cwt. 74 lb.

9. Simplify $.375$ of 16 mi. + $.\dot{4}\dot{6}$ of 198 rd. + $.3\dot{5}$ of $4\frac{1}{2}$ yd.

10. How many tons, cwt., etc., are there in $.\dot{3}7\dot{5}$ of 185 t.?

EXERCISE CCLXXVIII.

1. Describe the vulgar fractions whose equivalent decimals are finite.

2. Why do $\frac{3}{4}$, $\frac{7}{8}$, $\frac{9}{10}$, $\frac{9}{40}$, $\frac{17}{20}$, $\frac{45}{60}$ and $\frac{21}{56}$ produce finite decimals?

3. How many figures will there be in the decimals equivalent to $\frac{7}{10}$, $\frac{5}{8}$, $\frac{17}{32}$, and $\frac{21}{200}$?

4. Why do $\frac{5}{6}$, $\frac{7}{9}$, $\frac{8}{11}$ and $\frac{17}{30}$ produce infinite decimals?

5. How many figures will there be in the non-repeating part of the decimals, equivalent to $\frac{5}{6}$, $\frac{17}{18}$, $\frac{13}{30}$, $\frac{11}{24}$, and $\frac{17}{96}$?

6. Whether is 7.45648 more accurately represented by 7.456 or by 7.457?

7. Show that $.005 \times .005 \times .04 \times .04 = .0002 \times .0002$.

8. Show how a number may be multiplied or divided by 10, 100, 1000, etc., by merely shifting the decimal point.

9. Suppose unity represents .0015, what decimal will represent .0002?

EXERCISE CCLXXIX.

1. A father, dying, left $.\dot{5}1\dot{8}$ of his property to the elder of his two sons, and $.\dot{5}1\dot{8}$ of the rest to his younger, and the remainder to his wife. The elder son received $1960 more than the younger. What did the elder son receive?

2. A reservoir is $63.\dot{3}$ ft. long and 48.5 ft. wide. How many cubic feet of water must be pumped out of it to make the water sink 3 ft.?

3. Divide $654.50 among A, B and C in proportion to the numbers $1.\dot{3}$, 2.5, and $2.\dot{7}$.

4. A man, after spending .4 of his money, found that $.\dot{6}$ of the remainder was $40. How much had he at first?

5. Multiply the sum of 1.5, $.\dot{6}$ and .75 by the difference between $.2\dot{6}$ and .15, and divide the product by $43.\dot{5}$.

6. A man on a journey goes $.\dot{6}$ of it by train, $.\dot{1}\dot{8}$ of it by street car and walks the remaining distance in $1.\dot{6}$ hours at the rate of 3 miles an hour. How far is the distance?

7. The area of a square field is 72.9 acres. How long will A require to walk around it at the rate of $3.\dot{3}$ miles per hour?

8. A grocer buys tea at 30c.; twice as much at $33.\dot{3}$c.; and three times as much at $36.\dot{6}$c. per lb. He mixes the three kinds together and sells the mixture at 40c. per lb. Find his gain per cent.?

9. Subtract .08 from $.\dot{0}\dot{8}$ and divide the remainder by .625.

II. PROBLEMS RELATING TO WORK DONE.

EXERCISE CCLXXX.

1. If A and B can do a work in $\frac{3}{4}$ of a day, and B alone can do it in $2\frac{1}{2}$ days, how much more does A do than B in 1 day?

2. A can do a work in $\frac{1}{2}$ day; B can do it in $\frac{1}{3}$ day and C in $\frac{1}{4}$ day. How long will it take if all begin working together to do the entire work?

3. A can do a work in $4\frac{1}{2}$ days; B can do it in $3\frac{3}{5}$ days. With the help of C the work can be done in $1\frac{1}{4}$ days. In what time can C do the work?

4. A's working power is $\frac{5}{6}$ of B's working power. How long would A take to do what B does in $12\frac{1}{4}$ days?

5. B takes $\frac{7}{8}$ of the time that A takes to do a work. What fraction of B's working power is A's working power?

6. A and B take 18 days to do a work, A doing twice as much as B. In what time could each do the work by himself?

7. A, B, and C can do $\frac{5}{8}$ of a work in $3\frac{1}{2}$ days, A doing half as much as B and twice as much as C. In what time could each do the work by himself?

8. If 10 men can do a work in 15 days, how soon after commencing must 4 additional men be employed so that the work may be done in 12 days?

9. A can do a work in 27 days, and B in 15 days. A works at it alone for 12 days; B then works alone for 5 days; then C finishes the work alone in 4 days. In what time could C do the whole work by himself?

10. If 5 men *or* 16 boys can do a piece of work in 15 hours, in what time could 3 men *and* 48 boys do the work?

11. If the times taken by A, B, and C to do a work are as 1, 2, and 3; and together they can do the work in 20 days, in what time could each do it by himself?

12. A does $\frac{4}{5}$ of a piece of work in 12 days. He then calls in B, and they finish the work in $1\frac{1}{2}$ days. How long would B take to do the whole work by himself?

13. A and B can together do a work in 14 hr. 56 min. A alone can do it in 28 hr. In what time could B alone do it?

14. A can do a work in $3\frac{3}{4}$ hr., B in $2\frac{1}{2}$ hr., and C in $3\frac{1}{3}$ hr. In what time will it be finished by the three, if B begin $\frac{1}{2}$ hour after A, and C $22\frac{1}{2}$ min. after B?

15. If 2 horses do the same work as 3 mules, how many horses along with 7 mules will be required to draw $9\frac{1}{2}$ tons the same distance in the same time that 6 horses and 5 mules can draw 7 tons?

16. A can do a work in 12 days; B can do it in 15 days and C in 10 days. They all begin to work together but A stops 2 days and B $1\frac{1}{2}$ days before C who finishes the work. How long does each one work?

17. A can do a piece of work in $7\frac{1}{2}$ hr.; B can do it in $8\frac{1}{4}$ hr. If they do it together and the work is worth $2.10, what sum ought each to receive?

III. CLOCK PROBLEMS.

EXERCISE CCLXXXI.

1. The hands of clock are together. In what time will they be 11 minute-spaces apart? 22 minute-spaces apart? $27\frac{1}{2}$ minute-spaces apart?

2. The minute-hand is $16\frac{1}{2}$ minute-spaces behind the hour-hand. When will they be together?

3. At what time between 3 and 4 o'clock are the hands of a watch together?

4. Find the first time after 6 o'clock that the hands of a clock are at right angles.

5. The hands of a clock are opposite each other at 6 o'clock. At what time will they be together for the first time?

6. Find the first time after 5 o'clock that the hands of a clock will be 3 minute-spaces apart.

7. Find the times between 6 and 7 o'clock when the hands of a watch are 8 minute-spaces apart.

8. Find the time after 8 o'clock when the hands of a clock are (*a*) together; (*b*) at right angles; (*c*) opposite each other.

9. Find the times between 9 and 12 o'clock when the hands of a watch are together.

10. Find the first time after 5 o'clock that the hands of a watch are equally distant from the figure five.

EXERCISE CCLXXXII.

1. Find the first time after 4 o'clock that the hands of a watch are 48° apart.

2. The hands of a watch are 18° apart for the second time after 3 o'clock. Find the time.

3. Find the first time after 6 o'clock that the minute-hand is midway between the hour-hand and the figure six.

4. Two clocks are together at 12 o'clock. One loses 8 sec. and the other gains 7 sec. in 24 hours. When will one be half an hour ahead of the other and what time will each show?

5. Two clocks are together and show correct time at noon. One loses 5 sec. and the other 7 sec. in 12 hr. When will one be 5 minutes faster than the other?

6. A clock loses 5 sec. in 24 min. At 9 p.m. on Monday it is 17 min. fast. When will it show correct time?

7. A watch set accurately at 12 o'clock indicates 5 min. to 5 at 5 o'clock. What is the exact time when the watch indicates 5 o'clock.

8. One clock gains 2 min. in 12 hr., and another loses 2 min. in 24 hr. They are set right at noon on Friday. What is the time indicated by each clock when one appears to have gained $8\frac{1}{4}$ minutes on the other?

9. A clock which was $1.\dot{4}$ min. fast at quarter to 11 p.m. on May 2, was 8 min. too slow at 9 a.m. on May 7. When was it exactly right?

10. A watch showing correct time at noon on Tuesday gains 3 min. 40 sec. in 24 hr. What is the correct time on Saturday evening when it is 10 o'clock by the watch.

IV. PROBLEMS INVOLVING VELOCITY.

EXERCISE CCLXXXIII.

1. How many feet per second is equal to a rate of 30 miles per hour?

2. How many miles per hour is equal to a rate of 50 ft. per second?

3. A train 22 rods long passes a post in 11 seconds. At what rate per hour is it moving?

4. How long will a train 60 yd. in length, moving 30 miles per hour take to pass another 50 yd. long standing on a siding?

5. A railway train moving at the rate of 49 miles per hour goes 7 miles while a coach goes 2 miles. How long will it require the coach to go 3.36 miles?

6. A is walking 4 miles an hour, and B, who is 4 miles ahead of him, is walking 3½ miles an hour in the same direction as A. How long will it be before A overtakes B?

7. A starts from Sarnia to walk to London, a distance of 60 miles. At the same time B starts from London to walk to Sarnia. If A goes 4½ miles per hour and B 3½ miles per hour, how far from Sarnia will they meet?

8. In a mile race A can beat B by 80 yd. and C by 87 yd. By how much can B beat C in a mile race?

9. In a mile race A can beat B by 22 yd. and B can beat C by 11 yd. How many yards start can A give C that there may be a dead heat?

10. If the hands of a clock coincide every 65 minutes, how much does the clock gain or lose in a day?

V. PROBLEMS INVOLVING THE SUM AND DIFFERENCE OF TWO NUMBERS.

EXERCISE CCLXXXIV.

1. The sum of two numbers is 365; their difference is 83. Find the numbers.

2. A man rows at the rate of 7 miles per hour down a stream which flows at the rate of 1½ miles per hour. Find his rate of rowing against the current.

3. A man can row 8 miles down stream in 2 hours, but he takes 3 hours to row back to the starting point. Find the rate of the stream.

4. If a man rows 10 miles in 2½ hours against a stream, the rate of which is 1½ miles per hour, how long will he be in rowing 3½ miles down the stream?

5. A man rows 15 miles down stream in 2½ hours and up in 4 hours. Find his rate of rowing in still water.

6. A can row a distance down stream in 15 minutes and the same distance up in 20 minutes. What is the distance, the rate of the stream being 1 mile per hour?

7. A man rows on the still water of a canal one mile in 15 min. He then reaches the river and rows down stream 1⅓ miles in the next 15 min. How long will he take to return to the starting-point?

8. How far can a man who rows 4 miles per hour in still water row up stream, which flows at the rate of 2 miles per hour, so that he may be 2 hours before he returns to the boat-house?

9. A crew can row down a stream a certain distance in 2 hours and back the same distance in 3 hours. Compare the rate of rowing in still water with the rate of the stream.

10. If A can row $6\frac{2}{3}$ miles in $2\frac{1}{2}$ hours against a stream flowing $1\frac{1}{3}$ miles an hour, how long will it take him to row 12 miles with the current?

EXERCISE CCLXXXV.

1. A skated 6 miles at the rate of 10 miles an hour with the wind and returned against it in 50 minutes. Find the rate of the wind per hour.

2. Two trains moving on parallel tracks in opposite directions, and respectively 110 yd. and 88 yd. long, pass each other in 5 sec., and, when moving in the same direction, the faster passes the other in 45 sec. Find their rates in miles per hour.

3. A train 110 yd. long, moving $\frac{1}{2}$ mile a minute, meets another on a parallel track, moving 40 ft. per sec. and passes it in 8 sec. Find the length of the second train.

4. If telegraph poles are 88 yd. apart, and one is observed to pass the window of a railway car every 4 sec., at what rate per hour is the train moving?

5. An express train going 57 miles an hour passes a station $5\frac{1}{2}$ min. after a freight, going 38 miles an hour. When will the express overtake the freight?

6. A train going 30 miles an hour passes a man walking in the same direction at 3 miles per hour in 10 sec. Find the length of the train.

7. The whole time taken by a train 150 yd. long in crossing a bridge at the rate of 25 mi. per hour was 20 sec. Find the length of the bridge.

8. If a train 88 yd. long overtakes a person walking at the rate of 4 miles per hour and passes him in 10 sec., what is the rate of the train in miles per hour?

9. If a train 110 yd. long meets a person walking on the railway at the rate of 5 miles per hour, and passes him in 8 sec., what is the rate of the train in miles per hour?

10. A train 352 ft. long overtakes a man going in the same direction at 4 mi. per hour and passes him in 15 sec. Shortly after it passes a man walking in the opposite direction in 9 sec. At what rate per hour is the second man walking?

11. A train 88 yd. long takes 10 sec. to cross a bridge 44 yd. long. At this rate, how many hours will it take the train to go 180 miles?

VI. REVIEW EXERCISES FOR THIRD CLASS.

EXERCISE CCLXXXVI.

1. Two pieces of cloth of the same length cost $53.64 and $69.12, respectively. The price of the first was $1.49 a yard. What was the price of second per yard?

2. Three bags contained 625 nuts. The first bag contained 25 more than the other two together; and the second contained 50 more than the third bag. How many nuts are there in each bag?

3. A man living on $700 a year for 6 years finds that he is exceeding his income and then lives on $500 a year for 4 years and finds he is just out of debt. What was his income?

4. How often can £3 17s. 10¼d. be subtracted from £288 4s. 11d., and what is the last remainder?

5. A boy had the same number of five, ten, and twenty-five-cent pieces, and had $6.80 in all. How many pieces of each kind had the boy?

6. Find the largest number that will divide 365, 546, and 1140, leaving as remainders 20, 17, and 13, respectively.

7. A, B and C have £53 6s. 8d. among them. B and C have £40 2s. 8d.; A and C have £29 10s. How much has C?

8. How many boards 15 ft. long will build a straight fence, 6 boards high, around a field 120 rods long and 30 rods wide?

9. A man ploughs a furrow 8 in. wide the whole length of a field in 6 minutes. How many hours will be required to plough a ridge 16 ft. wide?

10. A farmer's wife sold 8 pairs of ducks at 75 ct. a pair and 13 pairs of chickens at 50 ct. a pair and received payment in sugar at 16 lb. for 1 dollar. How many pounds did she receive?

EXERCISE CCLXXXVII.

1. Into a rectangular cistern, the bottom of which is 8 ft. by 6 ft., water is pouring at the rate of 500 gal. per hour. How long will it take to fill the cistern to a depth of 4 ft.?

2. Divide $25.75 among 10 men, 8 women, and 7 boys, giving each man 50 ct. and each woman 25 ct. more than each boy.

3. A agrees to trade apples at $2.50 per bbl. for cloth at $1.75 per yard. What is the least numbers of barrels that can be exchanged for an integral number of yards?

4. The quotient is 7469; the divisor is 728, and the remainder is 19. If the dividend remains unchanged what divisor would give as quotient 5320 and remainder 411?

5. A and B ran a race. B had a start of 20 yd., but A ran 3 yd. while B ran 2 yd. and won by 5 yd. Find the length of the race?

6. If 30 men do a piece of work in 24 days working 10 hours a day, in how many days would 25 men do the same piece of work, working 9 hours a day?

7. The hind wheel of a wagon is 12 ft. in circumference and turns 7480 times in going from one village to another. How many miles are the two villages apart?

8. A man bought 120 A. of land for $7800. He sold 30 A., gaining $10 per A. and 45 A. at a loss of $15 per A. At what price per A. must he sell the rest to gain $300 in the whole transaction?

9. A farmer sold 250 animals (sheep and pigs) for $1720. He received $8 for each sheep and $6 for each pig. How many were there of each?

10. The cost of 5 coats and 4 vests is $33.25, each coat costing $1.25 more than a vest. Find the cost of a dozen coats.

EXERCISE CCLXXXVIII.

1. A bankrupt paid $2.50 out of $4 on one-half his debts and $2 out of $4 on the other half. Altogether he paid away $7200. How much did he owe?

2. A man buys 128 gal. of wine at $1.70 per gal. How much water must be added to gain $33.40 on the outlay by selling the mixture at $1 per gallon?

3. A farmer sells 9 horses and 7 cows for $1200 and 6 horses and 13 cows for the same sum. Find the price of 3 horses and 8 cows at the same price.

4. A person bought 475 apples at 5 for 6 ct. and another lot at 8 for 5 ct. He paid altogether $10.20. How many of the latter kind did he buy?

5. A divided a field 40 rods long and 24 rods wide into lots, each 165 ft. long and 66 ft. wide and sold all for $1800. What price did A get for each lot?

6. A grocer bought 60 chests of tea weighing 40 lb. each for £280 and sold it at 3s. 6d. per lb. How much did he gain?

7. What is the value of a pile of cord wood 60 ft. long, 8 ft. wide and 8 ft. high at $3.25 per cord?

8. Find the greatest unit of time by means of which 23 hr. 2 min. 36 sec. and 46 hr. 8 min. 55 sec. can both be expressed as integers.

9. Divide $1078 among John, Thomas, and Henry, so that John has 5 times as much as Thomas, and Thomas 8 times as much as Henry.

10. A farmer planted 60 rows of corn. Each row had 240 hills and 5 hills produced one quart. The crop was sold for $50.40. What was the price per bushel?

EXERCISE CCLXXXIX.

1. Find the cost of carpeting a room 18 ft. long and 13 ft. 6 in. wide with carpet 2 ft. 3 in. wide at 75 ct. a yard.

2. How much rope will it take to tie a box in the ordinary way, the box being 4 ft. by 3 ft. 2 in. by 2 ft. 8 in., allowing 1 ft. 6 in. for the knot?

3. The average height of four boys is 4 ft. 7 in.; but if the height of two others be considered, the average height of the six will be 4 ft. 5 in. Find the average height of the other two.

4. If 5 lemons are worth 4 oranges, and 2 oranges are worth 3 apples, find the price of 15 lemons when apples are worth 10 ct. per doz.

5. Find the smallest number of rails of equal length that can be used without cutting to make a straight fence 6 rails high around a rectangular lot 1089 ft. long and 1375 ft. wide.

6. The product of four consecutive numbers is 212520. Find the numbers.

7. On counting out the marbles in a bag by 3 at a time, or by 4 at a time, or by 5 at a time there are always 2 over; but on counting them 7 at a time there are none remaining. Find the least number of marbles there could be in the bag.

8. At 25 ct. per sq. yd. find the cost of painting a close board fence 6 ft. high round a rectangular lot 40 yd. long and 20 yd. wide.

9. How many shingles 4 in. wide and 4 in. exposed to the weather would be required for a roof 35 ft. by 25 ft.?

10. A bale of hay is 3 ft. long, 2 ft. wide, and 18 in. thick. A car 33 ft. long, 8 ft. wide, and 6 ft. high requires 26400 lb. to fill it. Find the weight of one bale?

VII. REVIEW EXERCISES FOR FOURTH CLASS.

EXERCISE CCXC.

1. A farmer bought two farms of 130 A. each for $19500. What was the cost of an acre of each, if 2 A. in one are worth 3 A. in the other?

2. In going to town the front wheel of a carriage makes 264 turns more than the hind one. If the former is 10 ft. and the latter 12 ft. in circumference, how far does the carriage go?

3. A laborer is to receive 95 ct. and his board each day he works, and pay 45 ct. for each day he is idle, to pay for his board. At the end of 100 working days he receives $76.80. How many days did he work?

4. Which is the greater cost and by how much:—fencing a lot 40 yd. long and 30 yd. wide at 15 ct. a foot or building a walk round it $4\frac{1}{2}$ ft. wide at 29 ct. per sq. yd.?

5. A water tank without a lid, 16 ft. 6 in. long, 7 ft. 6 in. wide, and 7 ft. deep, is lined with zinc weighing 8 lb. to the square yard. Find the cost of the zinc at $4.90 per cwt.

6. Four-fifths of a merchant's goods were destroyed by fire; $\frac{7}{8}$ of the rest were injured. He sold the injured goods at $\frac{1}{2}$ cost for $840 and the uninjured for $300. There being no insurance, find his loss by the fire.

7. A sum of money in 5 yr. at a certain rate per cent. simple interest amounts to $1131 and to $1339.80 in 9 yr. Find the sum and the rate per cent.

8. A goldsmith manufactured 2 lb. 3 dwt. 8 gr. of gold into rings, each containing 9 dwt. 16 gr. He sold them for $8.75 each. How much did he gain, gold being worth $18 per oz.?

9. If 150 men can do a work in 40 days, how soon after commencing the work must 60 additional men be employed so that the work may be done in 34 days?

EXERCISE CCXCI.

1. A legacy of $4500 is left to three persons in the proportion of 2, 3, and 4. What should each receive after deducting the legacy duty of 10%? 3600 75

2. A man paid $2580 for 85 head (horses and cattle), there being $\frac{5}{12}$ as many horses as cattle, and the cattle cost $8 less per head than the horses. Find the cost of a horse. 2688.20

3. A farmer sold a load of barley, weighing 3024 lb., when barley was 46 ct. a bushel. In weighing the grain, the dealer made a mistake and took it as rye, and paid 55 ct. a bushel. How much did the farmer gain or lose by the mistake? 47

4. A county map is drawn on a scale of 2 in. to the mile and covers a surface 4 ft. by $2\frac{1}{2}$ ft. How many acres are there in the county?

5. A rectangular field whose length is to its width as 4 to 3 contains 10 A. 268 sq. rd. Find its dimensions.

6. A bookseller sold a book 16% below cost. Had he received 50 ct. more for it, his gain would have been 4%. Find the cost of the book.

7. A stone wall, under a building 24 ft. longer than wide, contains 8550 cu. ft. This wall is 10 ft. high and $2\frac{1}{2}$ ft. thick. Find the dimensions of the building. 374

8. A father gave his son $128.50. This was $66\frac{2}{3}\%$ of what the father had left. How much money had the father at first? 100.

9. The amount of a note for 1 yr. 9 mo. at 6% simple interest was $391.17. What was the principal?

10. A farmer agreed to pay his hired man 8 sheep and $180 for one year's work. The man quit work at the end of 7 mo., receiving the sheep and $80 as a fair settlement. Find the value of each sheep.

EXERCISE CCXCII.

1. A and B earn $4.62 in 7 days; A and C, $7 in 10 days; and B and C, $8.36 in 11 days. How much did each earn per day?

2. A hare is 80 leaps before a hound, and takes 4 leaps while the hound takes 2, but 2 of the hound's leaps equal 5 of the hare's. How many leaps will the hound take to catch the hare?

3. A sells goods to B at a gain of 12%, and B sells the same goods to C at a gain of 15%. C paid $3155.60 for the goods. What did the goods cost A?

4. Find the time a train 184 yd. long, running 21 mi. per hour, will take to pass another on a parallel track 135 yd. long, going in the same direction at the rate of 16 mi. per hour.

5. A house and lot are together worth $4750. Twice the value of the house is equal to 17 times the value of the lot. Find the value of the lot.

6. If a grain dealer by selling 416 bu. of oats for 277\frac{1}{3}$ loses 10%, at what rate per bu. should he have sold the oats to gain 8%?

7. A man mowing grass travelled 4 mi. per hour. In 72 min. he cut $2\frac{2}{11}$ A. What width did the machine cut?

8. I bought 2000 lb. of sugar, part at 7 ct. and part at 10 ct. per lb. Had I bought all at 8 ct. per lb., it would have cost $13 less than it did. How many pounds of each kind did I buy?

9. The area of a rectangular field whose breadth is $\frac{1}{4}$ of its length is 15376 sq. yd. Find its dimensions.

10. A hall 60 ft. long is to be carpeted. It is found that by stretching the carpet lengthwise any one of 4 pieces—$\frac{3}{4}$ yd., 1 yd., $1\frac{1}{4}$ yd. and $1\frac{1}{2}$ yd. wide respectively—will exactly fit the hall without cutting anything from the width of the carpet. Find the cost of carpeting the hall with the narrowest piece at $1.10 per yard.

EXERCISE CCXCIII.

1. A train going 30 mi. an hour passes a man going in the same direction at 3 mi. an hour in 10 sec. How long is the train?

2. A and B enter into partnership. A puts in $4900 and B $1400. B receives 6% of all the profits for management. The rest is divided in proportion to the capital invested. What is A's share of $450 profit?

3. In a long division example the dividend is 1768479, and the successive remainders from the first to the last are 127, 180, 166, 28. Find the divisor and the quotient.

4. What is the prime cost of a yard of cloth, if selling it at 7% gain brings $1 more than selling it at 17% loss?

5. Twenty-five animals (cows and calves) cost $427.75, but, if the number of cows and calves is reversed, they would cost $303.50. A calf being worth $5.75, find the cost of a cow.

6. A and B run a two mile race; A wins. If B had run one-third faster, he would have won by 22 yd. Compare their rates of running.

7. A can dig 36 post-holes in a day; B, 32; and C, 30. What is the smallest number of post-holes that will furnish an exact number of days' labor for each working alone, for any two, or for all three working together?

8. A, B and C together invest $4860 in wheat. A invests twice as much as B, and C invests twice as much as A and B together. They gain 40% on their investment. What is each person's share of the gain?

9. If my income of $1150 is reduced by taxation to $1063.75, what is the income of another who has $1554 left after paying his taxes?

10. A sold two city lots at the same price. On one he gained 20% and on the other he lost 20%. He lost $30 by the transaction. Find the cost of each lot.

VIII. REVIEW EXERCISES FOR FIFTH CLASS.

EXERCISE CCXCIV.

1. What is the least number by which 2016 must be multiplied to become a perfect cube? What will be the cube root of this cube?

2. Divide $1650 into two parts such that the simple interest on one of them, at 4½% for 3 yr., would be equal to that on the other for 2¼ yr. at 5%.

3. A man bought a horse and sold him at 10% loss. If he had received $45 more for it, he would have gained 12½%. What did the horse cost?

4. Simplify $\frac{(.201-.102)^2}{(201)^2-(102)^2}$.

5. A marked goods at an advance of 40%, but in selling them a false balance was used, by means of which he gave 14 oz. to the pound. His total gain being $240, find the cost of the goods.

6. The amount of a sum for a certain time at 8% is \$336, and at $7\frac{1}{2}$% for the same time it is \$330. Find the sum and the time.

7. A solid sphere of iron 12 in. in diameter is melted and cast into a hollow cylinder $6\frac{1}{2}$ in. in radius and 8 in. long. Find the thickness of the iron in the cylinder.

8. A hare takes 4 leaps to 3 of a greyhound; but 2 of the hound's are equivalent to 3 of the hare's. The hare has a start of 50 of its own leaps. How many leaps must the hound take to catch the hare?

9. A clock loses at the rate of $8\frac{1}{2}$ sec. per hour when the fire is alight and gains at the rate of $5\frac{1}{10}$ sec. per hour when the fire is not burning. Upon the whole it neither gains nor loses each day. How long in the 24 hours is the fire burning?

10. A walks a distance at a certain rate. If he had walked 1 mi. per hour faster, his time would have been $\frac{3}{4}$ of what it was. If he had walked 1 mi. per hour slower, he would have taken 4 hours longer than he did. Find the distance.

EXERCISE CCXCV.

1. A man buys wine at \$3.20 per gallon; 20% leaks away. At what price per gallon must he sell the remainder to make 20% on the outlay?

2. A's income is derived from the proceeds of \$2275 at a certain rate per cent. and \$2700 at 1% more than the former rate. His total income being \$425, find the rates.

3. A grocer has two kinds of tea. By selling the first kind at 45 ct. a pound, he gains 25%, and by selling the second at 42 ct. per pound he gains 40%. If he mixes them in equal quantities and sells the mixture at $43\frac{1}{2}$ ct. per pound, find his gain per cent.

4. A shipment of wheat was insured at $2\frac{2}{5}$% to cover three-fourths of its value. The premium was \$44.07. The wheat being worth 80 ct. per bushel, find the number of bushels there were in the shipment.

5. In a constituency having 3200 voters, A received 23 votes for every 25 votes received by B, and was defeated by 124 votes. How many did not vote?

6. How fast is a locomotive going when the small wheel, which is 4 ft. in diameter, makes 180 revolutions per minute more than the large wheel, which is 7 ft. in diameter?

7. Ten men can do a work in a certain time, but 7 men would require the same time and 7 days more to do the same work. How long did it take the ten men to do it?

8. There is a grass plot in the form of a circle 145 yd. in radius and a carriage drive round the outside of it 4 yd. wide. How many cu. yd. of gravel will be required to cover the drive to the depth of 8 inches?

9. A can do a piece of work in 10 days; B, in 12 days; and C, in 15 days. They all begin to work together, but C stops 2 days and B 1½ days before the work is finished. A finishes the work. How long does he work?

10. Divide $2699.16 among A, B, C and D, so that A may have 12% more than B; B, 10% more than C; and C, 5% more than D.

EXERCISE CCXCVI.

1. A farmer raised 3105 bu. of oats in 2 years. He had 30% more the first year than the second year. How many more bushels had he the first than the second year?

2. The breadth of a room is half as much again as the height, and the length is twice the height. It costs $33.60 to paint the walls at 30 ct. per sq. yd. Find the dimensions of the room.

3. Iron weighs 7.112 times as much as water. How many cu. ft. are there in a ton of iron?

4. A person holding $5000 of 5% stock and $7600 of 6% stock sold the first at 110 and the second at 115, and re-invested the proceeds in 4½% stock at 89. Find the gain or loss in his income?

5. How many oranges must a boy buy and sell to make a profit of $12, if he buys at the rate of 5 for 3 ct. and sells at the rate of 4 for 3 ct.?

6. The price of gold is £3 17s. 10½d. per oz. A compound of gold and silver, weighing 18 lb., is worth £637 7s.; but if the proportions are reversed, it would be worth £259 1s. Find the value of silver per oz. and the proportion of gold and silver.

7. A drover bought sheep at a certain price per head. He sold ⅜ at a gain of 20%, $\frac{3}{10}$ at a gain of 15% and the rest at a loss of 10%, and gained on the whole $217. How much did he pay for the sheep?

8. A rows 30 mi. and back in 12 hours, and he finds he can row 5 mi. with the stream in the same time as 3 mi. against it. Find the rate of the stream.

9. If the time past 3 p.m. is to the time past 1 a.m. as 4 to 1, find the time.

10. The sides of a rectangle are in proportion of 5 to 6, and it contains ¾ A. Find the cost of painting a close board fence 6 ft. high around it at 45 ct. per sq. yd.

EXERCISE CCXCVII.

1. Find the area of a square inscribed in a circle 48 ft. in diameter.

2. The net proceeds of the sale of 1000 tons of hay at \$20 a ton after deducting \$875 for freight, etc., were \$18325. What rate of commission was charged?

3. From a cask of wine one-fourth is drawn off, and the cask is filled up with water; one-fourth of the mixture is then drawn off, and the cask again filled up with water; after this process has been repeated four times altogether, what fraction of the original quantity of wine will be left in the cask?

4. A wall whose height is $\frac{1}{8}$ of its length, and whose thickness is $\frac{1}{5}$ of its height, contains $625630\frac{5}{64}$ cu. in. Find its thickness.

5. Express as a vulgar fraction, and also as a decimal, the difference between $25.\dot{1}\dot{3}5 \times 13\frac{7}{31}$ and $61.375 \times 5\frac{15}{37}$.

6. Calculate the ratio between the values of gold and silver, if from 2 lb. of standard gold are coined 89 guineas, and from 1 lb. of standard silver 66 shillings, $\frac{1}{12}$ of standard gold being alloy, and $\frac{3}{40}$ of standard silver.

7. A grocer bought 1500 lb. of tea and sold 300 lb. at 45 ct. a pound, making $12\frac{1}{2}$% profit. Find the price at which he must sell the remainder per pound to gain 20% on his outlay.

8. A merchant bought 240 yd. of silk. He sold $\frac{1}{4}$ of it at 25% gain; $\frac{1}{3}$ of it at 20% gain; and the remainder at 15% loss, and received \$800 in all. How much did the silk cost him per yard?

9. How much less will it cost to fence a square field of 40 acres than a rectangular one of the same size, 90 rods long, at 81 ct. a rod?

10. By selling \$1000 of 3 per cent. stock at 95 and reinvesting the proceeds I increase my income \$10 a year. If the dividend on the new investment is at the rate of 8%, what is the price of the stock?

EXERCISE CCXCVIII.

1. A rectangular field contains 27 A. 48 sq. rd., and 13 times its length is equal to 21 times its breadth. How many rods of fencing will be required to enclose it?

2. A buys \$18300 of 3% stock at 75 and pays for it with money loaned at 8% per annum. At the end of a year he sells out and his gain is \$122. At what price did he sell the stock?

3. A bought cloth at 20 ct. and the same quantity at 30 ct. per yard. He sold all at the same price per yard so as to gain as much per cent. on the one kind as he lost on the other kind. Find the selling price and the total gain or loss per cent.

4. The area of the two larger walls of a room is 816 sq. ft.; of the two smaller, 624 sq. ft.; and of the floor, 884 sq. ft. Find the dimensions of the room.

5. The road between A and B, distant 15 miles, goes over a hill whose summit is 3 miles from A. Two men set out at the same time from A and B, the former going 4 miles per hour up hill and $5\frac{1}{4}$ down, the latter $3\frac{1}{2}$ up and $4\frac{1}{2}$ down. How far will the slower have to go when the faster reaches B?

6. A pond 6 A. in area is frozen over to a depth 6 in. If a cubic foot of water weighs 1000 oz. and ice is $\frac{9}{10}$ as heavy as water, find how many tons of ice there are on the pond.

7. A man bought 63 sheep. He sold $\frac{4}{9}$ of them at 15% gain; $\frac{1}{7}$ of them at 50% gain; and the rest at 25% loss. His total gain was $15.40. How much did he pay for the sheep?

8. A's present age is to B's as 9 is to 5, and 23 years ago the proportion was 10 to 3. Find the present age of each.

9. If gold can be beaten out so thin that a grain will form a leaf of 56 sq. in., how many of these leaves will be required to make up the thickness of a sheet of paper, the weight of a cu. ft. of gold being 1215 lb. and 400 sheets of paper being 1 in. thick?

10. If 5 men, 4 women, and 3 boys can complete a piece of work in 150 days, what time would it take 9 men, 15 women and 18 boys to do twice as much, the parts done by each in the same time being as 3, 2, and 1, respectively.

EXERCISE CCXCIX.

1. The perimeter of a semicircular flower-bed is 60 ft. How many plants will it contain, allowing 1 sq. ft. to each plant?

2. A sold a farm to B at 15% loss; B sold it to C at 10% loss; and C sold it to D for $3786.75 at 10% gain. How much did the farm cost A?

3. A can row $4\frac{1}{2}$ miles an hour in still water and he finds he can row a distance down stream in one-third of the time he can row back again. Find the rate of the stream per hour.

4. How much tea at 48 ct. a pound must be mixed with tea at 60 ct. a pound to form a mixture of 180 lb. in which the value of the different teas will be equal?

5. A grocer buys coffee at $34 per cwt. and chicory at $10 per cwt. He mixes them in proportion of 5 lb. of chicory to 7 lb. of coffee and sells the mixture to gain $\frac{1}{6}$ of the cost. How much does he charge per pound?

6. A town levied a tax for a bridge which cost $2520. Allowing 4% for the cost of collection, what sum was levied?

7. A merchant's debts amounted to $5000. One-half of his stock was sold at 31¼% discount and the rest at 12½% discount. His creditors received 62½% of what was owing them. Find the value of the goods.

8. White cedar weighs 20 lb. to the cu. foot, while a cu. ft. of water weighs 62½ lb. A kind of iron is 7.492 times as heavy as water. What thickness of iron will be of the same weight as a 9 in. plank of white cedar, their lengths being equal?

9. A cube contains 11390625 cu. in. Find to four places of decimals the difference between the lengths of the edge and of the diagonal.

10. Two men formed a partnership. A put in $10000, and B $16000. They lost $2080 and their capitals were reduced accordingly. They then took in C as partner with $18000. They gained $4716. How much should each receive?

EXERCISE CCC.

1. A merchant mixes wine at $3 a dozen with wine at $3.60 a dozen. He sells the mixture at $4.32 a dozen at a gain of 26%. In what proportions are the two kinds mixed?

2. It is between 4 and 5 and the hands of a watch form with a line joining their extremities an isosceles triangle, each of whose angles at the base is half the third angle. What is the time?

3. I bought an article and sold it at a loss of 20%. If the cost had been 10% less and the selling price $13 more, I would have gained 25%. Find the cost.

4. The expense of carpeting a room was $45. If the breadth were 1 yd. less the cost would be $36. Find the breadth.

5. Seven pounds of tea being mixed with 4 lb. of a better quality the mixture is worth 88 ct. per pound. What is the value of each kind, the difference of values being 22 ct. per pound?

6. I buy two houses for $5850 and sell one at a loss of 8% and the other at a gain of 10% and neither gain nor lose on the whole transaction. How much did each house cost?

7. The sides of two squares are 232¾ ft. and 23⅛ ft. respectively. Find the side of a square whose area is equal to the sum of the areas of the other two squares.

8. If 175 men and 240 boys do in 1330 days the same amount of work as 603 men and 1005 boys in 350 days, compare the average daily work done by each man with that done by each boy.

9. In the centre of a room 21 ft. square, there is a square carpet. The rest of the floor is covered with oil-cloth. The carpet and the oil-cloth cost respectively $2.40 and 96 ct. per sq. yd.; and the whole cost of carpet and oil-cloth is $90.60. Find the width of the oil-cloth.

10. Three merchants enter into partnership. The first, A, puts in $960 for 6 months; the second, B, a certain sum for 12 months; and the third, C, $640 for a certain time when the accounts were settled. A received $1200 for his stock and profit, B $2400 for his, and C $1040 for his. What was B's stock and C's time?

EXERCISE CCCI.

1. If the telegraph poles at the side of a railway are 60 yd. apart, what fraction of the true speed will the error be in reckoning the speed of the train to be twice as many miles per hour as the train passes poles per minute.

2. A and B go to market and buy together 80 lb. of meat at 10 ct. per lb. A takes 50 lb. and B the rest. Upon examination, they agree that A's meat is worth $\frac{1}{2}$ ct. per lb. more than B's. How much must each pay for the meat.

3. A merchant borrowed $1300 at $3\frac{1}{2}\%$ and at the same time $1790 at 5% and paid both loans when the sum of principal and interest was $3202.50. How long did he keep the money?

4. Two circular gold plates each 1 in. thick and 6 in. and 8 in. in diameter, respectively, are melted and formed into one plate also 1 in. thick. Find its diameter.

5. A merchant sold 400 yd. of cloth. On one-fourth of it he gained 10% and 5% on the remainder. Had he sold it at 8% gain, he would have made $21 more. Find the cost price per yard.

6. Find the cost price of 3 per cent. stocks, so that if $36000 be invested, the income may be $1140 after paying an income tax of 5 ct. on the dollar.

7. If James can do $\frac{2}{3}$ of a work in 8 hr. and John can do $\frac{3}{4}$ of the remainder in 2 hr. and Charles can finish it in 40 minutes. What time would all take working together?

8. A piece of metal weighing 1410 lb. has been formed by compounding three metals in quantities which, by measure, are as 5, 3, 2; but the weights of equal volumes of them would be as 7, 11, 13. What weight of each of the component metals has been used?

9. Divide $5600 into 4 parts, such that the respective interests on the 1st at $2\frac{1}{2}$ per cent. for 4 months, the 2nd at 3 per cent. for 4 months, the 3rd at 4 per cent. for 5 months, and the 4th at 5 per cent. for 6 months may be the same.

10. In a mile race, A starts at 270 paces of 48 inches per minute, and B 300 paces of 44 inches per minute. After 4 minutes, B quickens his pace to 320. Supposing A continues at his original rate. Which wins, by how much, and in what time?

EXERCISE CCCII.

1. Find the difference between the area of a triangle whose sides are 23 ft., 29 ft. and 44 ft., respectively, and that of an equilateral triangle of the same perimeter.

2. Divide $3560 among A, B, C, and D, giving A 30% of D's share; C, 30% of A's share; and B as much as A and C together.

3. A sold a lot which cost $1875 and gained 6¼% of the selling price. He sold another which cost $1200 at 8% gain on the cost price. His whole gain was $221. Find the selling price of each.

4. A farmer holds two mortgages for $14000 and $34000 respectively, which bring in $2090 interest each year. The rate on the latter is ½% higher than that on the former. Find the rates.

5. A buys tea at 50c. per pound and the same quantity of a better quality. He mixes them and sells the mixture at 66c. per pound and thus gains 20% on his outlay. Find the price of the second kind of tea.

6. After a certain number of men had been employed on a piece of work 24 days and had half finished it, 16 men more were set on and the remaining half was completed in 16 days. How many men were employed at first?

7. A sets out to walk to a town at 3 miles an hour; B on a bicycle sets out with him at 12 miles an hour. On reaching the town B rests half an hour, and after riding 40 minutes on the return journey meets A. How far is the town distant from the starting point?

8. A banker increased his capital 10% per annum and in 4 years, the interest for one year at 4% on the capital he then had was $3660.25. Find his original capital.

9. The minute-hand of a town clock is 9 feet long. Find the time after twelve when its extremity has moved over 11 ft. on the dial.

10. If $5 be allowed as discount off a bill of $125 for a certain time, what should be the discount if the bill had twice as long to run, (1) at simple interest, (2) at compound interest?

ANSWERS.

Ex. IX. *1.* 49 ct. *2.* $47. *3.* 209 bu. *4.* 87 mi. *5.* 124 mi. *6.* 945769. *7.* 969 yd. *8.* 1367 mi. *9.* 786. *10.* 1668 pages.

Ex. XIV. *1.* 303. *2.* 354 A. *3.* 272 marbles. *4.* 158 mi. *5.* $7353. *6.* 1273 animals. *7.* 885 trees. *8.* MCXVII. *9.* 46391. *10.* 226.

Ex. XV. *1.* 40 marbles. *2.* $45. *3.* 870 pages. *4.* 300 mi. *5.* 1000 ct. *6.* $1900. *7.* $270. *8.* 98 ct. *9.* 208 mi. *10.* $7856.

Ex. XVI. *1.* 9054. *2.* $9000. *3.* 814 baskets. *4.* 106 ft. *5.* 170 ct. *6.* $129. *7.* 144 ct. *8.* 500 ct. *9.* 160 A. *10.* 90 sheep; $389.

Ex. XVII. *1.* $9991. *2.* $350. *3.* 197795. *4.* $52948276. *5.* 3617 sheep. *6.* 510 mi. *7.* $100. *8.* $120. *9.* 195 ct. *10.* 3666.

Ex. XVIII. *1.* 76 mi. *2.* 1159620. *3.* $45000. *4.* 1171460 oranges. *5.* $3811. *6.* 78. *7.* $31839. *8.* $12085. *9.* $33820. *10.* $33020.

Ex. XIX. *1.* 1990977. *2.* 72720, 147720. *3.* $18565. *4.* 154 yd. *5.* 31136. *6.* 131 ct. *7.* 365 days. *8.* 12413. *9.* 1832. *10.* $140900.

Ex. XXI. *1.* 111 cows. *2.* 40 chickens. *3.* $23. *4.* 113 pages. *5.* 272 gal. *6.* $150. *7.* 254 bbl. *8.* 1232 sheep. *9.* 433 A. *10.* $1200.

Ex. XXVII. *1.* 74. *2.* 286032. *3.* 6319267. *4.* 32299. *5.* 676. *6.* 2714. *7.* 526084. *8.* 2578. *9.* 6667315. *10.* 141998.

Ex. XXVIII. *1.* 89 sheep. *2.* $257. *3.* $468. *4.* 24168 bu. *5.* $1779. *6.* $2168. *7.* $49. *8.* 1432 mi. *9.* 162482. *10.* 158677 cows.

Ex. XXIX. *1.* $807. *2.* 39 marbles. *3.* 13999 men. *4.* $3816. *5.* 351636 min. *6.* 439 pages. *7.* $21506957. *8.* 6300836 ft. *9.* 117993. *10.* 83849884 lb.

Ex. XXX. *1.* 27 ct. *2.* 288. *3.* $11993. *4.* $35. *5.* 1642. *6.* 89 yr. *7.* 983 yr. *8.* 3688 ft. *9.* 1325 votes. *10.* 3969356.

Ex. XXXI. *1.* 45. *2.* $198. *3.* 215 bu. *4.* $3250. *5.* $32. *6.* $107950. *7.* $7178. *8.* 5 mi., 137 yd. *9.* 225 mi. *10.* 2210.

Ex. XXXII. *1.* $245. *2.* 1950. *3.* 1487 A. *4.* 45 yr., 38 yr. *5.* Loss, $2410. *6.* Jas. 31, Jno. 26. *7.* 45 A. *8.* 70 da. *9.* 18 marbles. *10.* 21171, 14896, 18691.

Ex. XXXIII. *1.* 6746. *2.* 12968. *3.* 1606. *4.* 2658225. *5.* 6529. *6.* 925358. *7.* 2534. *8.* 73699. *9.* 2155. *10.* 8453. *11.* 23718. *12.* 74128.

Ex. XXXIX. *1.* 1200 mi. *2.* $195625. *3.* 607488 oz. *4.* 1632000 mi. *5.* 63168 ct. *6.* 702 trees. *7.* 2920 mi. *8.* 95424 hills. *9.* $130455. *10.* 75087 lemons.

Ex. XL. *1.* 1530000 ct. *2.* 32076 yd. *3.* 2368 nails. *4.* 62640 mi. *5.* 171216 in. *6.* 383600 ct. *7.* 482040 ct. *8.* $204000. *9.* 525600 min. *10.* 5285484 papers.

Ex. XLI. *1.* 43050. *2.* $2241190. *3.* $5. *4.* 553 ct. *5.* $516. *6.* Gain, $32. *7.* 94720 ct. *8.* 2472 ct. *9.* 1037 mi. *10.* Loss, $83.

Ex. XLII. *1.* 172484. *2.* 233189. *3.* 1062347. *4.* 67419143. *5.* 15403465. *6.* 2016978981. *7.* 1123193115. *8.* 63096033. *9.* 50700. *10.* 14254.

Ex. XLIII. *1.* 55986805. *2.* 1516. *3.* 62985. *4.* 9989001. *5.* 7051253. *6.* $30613. *7.* 57415 ct. *8.* 15725910 A. *9.* 703 stooks, 8436 sheaves. *10.* 99693084.

Ex. XLVII. *1.* 16, 28, 44, 88 yd. *2.* $121. *3.* $75. *4.* 329 bbl. *5.* 142 lb. *6.* 524 lb. *7.* 15065 lb. *8.* 532 pk. *9.* $7625. *10.* 379 t.

Ex. XLVIII. *1.* 480 mi. *2.* 1760 yd. *3.* $13. *4.* 13 hr. *5.* 30 ct. *6.* $32. *7.* 57 persons. *8.* 362 mi. *9.* 11625000 mi. a min. *10.* 5642 pence.

Ex. LII. *1.* 6540. *2.* 391525. *3.* 489673. *4.* 150287. *5.* 481. *6.* 4798. *7.* 61. *8.* 378. *9.* 9605. *10.* 228689.

Ex. LIII. *1.* 134 da. *2.* $2003. *3.* 2640. *4.* 29603 lb. *5.* $658. *6.* 160 sq. rd. *7.* 327 mi. *8.* 275 persons. *9.* 168 lb. *10.* 9 da.

Ex. LIV. *1.* 179 mi. *2.* 96934 yd. *3.* 19 mi. *4.* 64 bu. *5.* 51 bu. *6.* 245 bu. *7.* 144. *8.* 75 c. yd. *9.* 207 bbl. *10.* 704 cd.

Ex. LV. *1.* 119. *2.* 910. *3.* 83. *4.* 1331424. *5.* 45. *6.* 27. *7.* 14839. *8.* 811. *9.* 41. *10.* 23849.

Ex. LVI. *1.* 7469. *2.* 23. *3.* 631229. *4.* 323603. *5.* 150321. *6.* 66. *7.* 245. *8.* 119025. *9.* 767561. *10.* 336.

Ex. LVII. *1.* 840 steps. *2.* 14668. *3.* 2380277. *4.* 1249. *5.* 962556. *6.* 179538. *7.* 253440 in. *8.* 20063110804. *9.* 35643910. *10.* 40160 ct.

Ex. LVIII. *1.* 91132497. *2.* $288. *3.* 1145348. *4.* 6029. *5.* 30595. *6.* 815. *7.* 99368. *8.* $254. *9.* 1420799. *10.* 2240 ct.

Ex. LIX. *1.* $336. *2.* 18 ct. *3.* $5 each. *4.* 2632 ct. *5.* 200 ct. *6.* $50. *7.* $1620. *8.* 485 sheep. *9.* 11657397. *10.* 8 yr.

Ex. LX. *1.* 2552. *2.* 18480 ct. *3.* 95 ct. *4.* 42. *5.* 10624. *6.* 960 ct. *7.* 72 ct. *8.* $4860. *9.* 113. *10.* 203.

Ex. LXI. *1.* 27 ct. *2.* 16 ct. *3.* 21 mi. *4.* $51. *5.* $150. *6.* 30 yd. *7.* 21 dresses. *8.* 1728 bu. *9.* 11 hr. *10.* 579600 lb.

Ex. LXII. *1.* 21 da. *2.* 95 da. *3.* 20 da. *4.* 27 da. *5.* 18 da. *6.* 15 men. *7.* 45 men. *8.* 6 men. *9.* 240 men. *10.* 225 men.

Ex. LXIII. *1.* 16, 20. *2.* 20, 30. *3.* 39 bu., 46 bu. *4.* 42 yd., 58 yd. *5.* 44, 50. *6.* 12 yr., 15 yr. *7.* 19, 28. *8.* 111 votes, 129 votes. *9.* 67 mi., 90 mi. *10.* 192, 195.

Ex. LXIV. *1.* 8458. *2.* 181357. *3.* $3570. *4.* 264 mi. *5.* $16. *6.* 240 ct. *7.* $6. *8.* $135. *9.* 170. *10.* $46836.

Ex. LXV. *1.* 33148. *2.* 5607 ct. *3.* 10 ct. *4.* 17. *5.* 47 ct. *6.* 21450 ct. *7.* 19 gal. *8.* $170. *9.* 2046 ct. *10.* $468.

Ex. LXVI. *1.* 120 pieces. *2.* 159 pieces. *3.* 9 ct. *4.* 21. *5.* 1800 ct. *6.* 11 stacks. *7.* 302304 ct. *8.* 500 A. *9.* 60 bu. *10.* 17 hats.

Ex. LXVII. *1.* 36405 bu. *2.* 202878 ct. *3.* 23 lb. *4.* $2028. *5.* Gain, $161. *6.* 38400 lb. *7.* 5355 ct. *8.* 4860 ct., 90 ct. *9.* 36 lb. *10.* 1953.

Ex. LXVIII. *1.* 1580712. *2.* 148 mi. *3.* $2277. *4.* 1862 ct. *5.* $2688. *6.* 150 boys. *7.* $31104. *8.* 86 A., $42. *9.* 132 head. *10.* 114 mi.

Ex. LXXIII. *1.* £83 12s. 9d.; £74 18s. 11d.; £810 2s.
2. 74 cwt. 64 lb. 3 oz.; 127 t. 0 cwt. 72 lb.; 56 t. 1 cwt. 28 lb. 3 oz.
3. 82 yd. 1 ft. 9 in.; 18 yd. 2 ft. 4 in.; 58 yd. 0 ft. 9 in.
4. 16 bu. 2 pk. 6 qt.; 32 bu. 3 pk. 5 qt. 1 pt.; 133 gal. 2 qt. 1 pt.
5. 38 gal. 3 qt.; 32 da. 18 hr. 51 min. 56 sec.; 7 wk. 4 da. 2 hr. 45 min. 33 sec.
6. £3 3s. 9d.; £19 9s. 3d.; 4 cwt. 22 lb. 10 oz.
7. 10 t. 15 cwt. 62 lb.; 3 yd. 1 ft. 5 in.; 47 yd. 1 ft. 3 in.
8. 28 bu. 1 pk. 7 qt.; 8 bu. 3 pk. 6 qt.; 2 qt. 1 pt.
9. 2 da. 18 hr. 8 min. 41 sec.; 1 wk. 5 da. 7 hr. 14 min. 45 sec.; 6° 50′ 39″.
10. 30° 53′ 49″; 31 c. yd. 18 c. ft. 1483 c. in.; 51 c. yd. 2 c. ft. 1488 c. in.

Ex. LXXIV. *1.* £66 9s. 2d.; £454 14s.; 136 cwt. 67 lb. 1 oz.
2. 61 t. 13 cwt. 31 lb. 8 oz.; 211 yd. 2 ft.; 967 yd. 0 ft. 3 in.
3. 23 bu. 0 pk. 1 qt. 1 pt.; 95 bu. 3 pk. 2 qt.; 34 gal. 0 qt. 1 pt.
4. 187 gal. 2 qt.; 159 da. 11 hr. 33 min.; 46 da. 13 hr. 34 min. 56 sec.
5. 123° 53′ 39″; 422° 17′ 20″; 86 c. yd. 22 c. ft. 967 c. in.
6. £20 9s. 5d.; £5 3s. 11d.; 7 cwt. 85 lb. 14 oz.
7. 2 t. 10 cwt. 64 lb. 9 oz.; 12 yd. 1 ft. 11 in.; 9 yd. 0 ft. 11 in.
8. 4 bu. 3 pk. 6 qt. 1 pt.; 8 bu. 0 pk. 1 gal. 1 qt.; 15 gal. 2 qt. 1 pt.
9. 4 gal. 1 qt. 1 pt.; 164 hr. 26 min. 24 sec.; 187 da. 21 hr. 55 min. 57 sec.
10. 19° 15′ 42″; 125° 9′ 24″; 19 c. yd. 22 c. ft. 969 c. in.

Ex. LXXV. *1.* 13; 32. *2.* 400; 35. *3.* 49; 42. *4.* 77; 720. *5.* 325; 64. *6.* 1856; 375. *7.* 90; 35. *8.* 2880; 156. *9.* 78; 1680. *10.* 1120; 303.

Ex. LXXVI. *1.* 4 ft. 8 in. *2.* 504 pt. *3.* 744 hr. *4.* 131, 36 oz. *5.* £116 16s. 3d. *6.* £54 13s. 4d. *7.* 11 ft. 6 in.; 6 ft. 6 in. *8.* 107° 40′ 38″. *9.* 353. *10.* $529.20.

Ex. LXXVII. *1.* $27. *2.* 1301. *3.* $104. *4.* 3080 yd. *5.* $164475. *6.* 342 min. *7.* 37 lb. 14 oz. *8.* 15 t. *9.* 3000 gal. *10.* $551760.

Ex. LXXVIII. *1.* 45 t. *2.* 60 spoons. *3.* 108. *4.* 15 pages. *5.* 42 mi. 60 rd. *6.* £110 10s. *7.* £9 7s. 6d. *8.* $54.92. *9.* 60 yd. *10.* 15 ct.

Ex. LXXIX. *1.* 95 gal. 2 qt. 1 pt. *2.* 12 gal. 2 qt. 1 pt. *3.* 278 bu. 36 lb. *4.* 23 bu. 13 lb. *5.* 5 min. 15 sec. past 8. *6.* 4 lb. 4 oz. 16 dwt. *7.* £3 17s. 10½d. *8.* 288 lb. *9.* $2919. *10.* 15 lb.

Ex. LXXX. *1.* $44.70. *2.* $153. *3.* $8778.50. *4.* $134.09. *5.* $297.45. *6.* $153.27. *7.* $17.81. *8.* $49.97. *9.* $2.56. *10.* $58.95.

Ex. LXXXI. *1.* $290. *2.* $2.79. *3.* $7.25. *4.* $311.48. *5.* $221.81. *6.* $5.32. *7.* $21.80. *8.* $42.70. *9.* $13.94. *10.* $71.91. *11.* $13.54.

Ex. LXXXII. *1.* 10 in.; 14 in.; 22 in.; 16 in. *2.* 56 ft. *3.* $45. *4.* 250 boards. *5.* $3.40. *6.* $700. *7.* $256. *8.* 14080 yd. *9.* $1440. *10.* 120 ft., 40 ft.

Ex. LXXXIII. *1.* 1224 sq. ft.; 1216 sq. ft.; 5616 sq. ft. *2.* 9 A.; 10 A.; 15 A.; 42 A.; 15 A.; 19 A. *3.* 18 sq. ft. *4.* 77 sq. yd. *5.* 2304 sq. yd. *6.* 200 sq. yd. *7.* 112 sq. in. *8.* 1056 sq. ft. *9.* 2000 sq. ft. *10.* 24 sq. ft.

Ex. LXXXIV. *1.* 18 ft. *2.* 54 ft. *3.* 40 rd. *4.* $290. *5.* $150. *6.* 500. *7.* 72 ft. *8.* $940. *9.* 360 ft. *10.* $660.

Ex. LXXXV. *1.* 40 yd. *2.* 60 yd. *3.* 32 yd. *4.* 70 yd. *5.* 196 yd. *6.* $57.60. *7.* $13. *8.* $130. *9.* $24. *10.* $12.60.

Ex. LXXXVI. *1.* 6; 9. *2.* 8. *3.* 16. *4.* 8. *5.* 10. *6.* 72 yd. *7.* 48 yd. *8.* $58.80. *9.* $88. *10.* $110.

Ex. LXXXVII. *1.* 80 sq. yd. *2.* 168 sq. yd. *3.* 224 sq. yd. *4.* $9.12. *5.* $40.02. *6.* 82 sq. yd.; 91 sq. yd. *7.* $23.60; $26.20. *8.* $21; $23. *9.* $39; $41.50. *10.* $70.20; $76.14.

Ex. LXXXVIII. *1.* 160 yd. *2.* 288 yd. *3.* 448 yd. *4.* 96 yd. *5.* 348 yd. *6.* 82 yd. *7.* 396 yd. *8.* 144 yd. *9.* $5.85. *10.* $16.25.

Ex. LXXXIX. *1.* 9 ft.; 24 ft.; 24 ft.; 24 ft.; 40 ft.; 24 ft.; 12 ft. *2.* 3300 ft. *3.* 4200 ft. *4.* 2220 ft. *5.* 7680 ft. *6.* 768 ft. *7.* 1650 ft. *8.* 10000 ft. *9.* $300. *10.* $540.

Ex. XC. *1.* 2880 c. ft. *2.* 210 c. ft. *3.* 60 c. yd. *4.* 210 c. yd. *5.* 4032 lb. *6.* $40.50. *7.* 13600 c. yd. *8.* 109 c. yd. 1 c. ft. *9.* 2376 c. ft. *10.* $1380.

Ex. XCI. *1.* 30 cd. *2.* 63 cd. *3.* 30 cd. *4.* $84. *5.* $216. *6.* $75.25. *7.* 80 ft. *8.* 5 ft. *9.* 8 ft. *10.* 224 ft.

Ex. XCII. *1.* 7 ft. *2.* 11 ft. *3.* 24 ft. *4.* 3 ft. *5.* 112 ft. *6.* 18144. *7.* 192 ft. *8.* 40 ft. *9.* 30 in. *10.* 17 ft.

Ex. XCIII. *1.* 32 ft. *2.* $40.25. *3.* $1080. *4.* 1120 lb. *5.* 32 t. *6.* 48 t. *7.* 1760 c. yd. *8.* $792. *9.* $1440. *10.* $72.

Ex. XCIV. *1.* $32.64. *2.* 220 yd. *3.* 3600 sods. *4.* 3 ft. *5.* 90 c. ft. *6.* 33 mi. *7.* 15 ft. *8.* 9 ft. *9.* 36 sq. yd. *10.* 5 ft.

Ex. XCV. *1.* $17; $23. *2.* 19 yd.; 30 yd. *3.* 36; 48. *4.* $48.75; $50.25. *5.* $27000; $23000. *6.* $215; $160. *7.* $425; $371. *8.* 271 mi.; 237 mi. *9.* 395; 361. *10.* $4500; $1250.

Ex. XCVI. *1.* $5120; $1280. *2.* 2064 bu.; 2311 bu. *3.* $2726. *4.* 361 yd.; 242 yd. *5.* 297; 315. *6.* 462; 534. *7.* 24 cd. 39 c. ft.; 27 cd. 89 c. ft. *8.* 9 A. 115 rd.; 10 A. 45 rd. *9.* 4 mi. 275 rd. *10.* 1 t. 8 cwt.; 2 t.

Ex. XCVII. *1.* 30; 90. *2.* 254; 508. *3.* 23 yd.; 92 yd. *4.* $2450; $9800. *5.* $75; $168. *6.* $145; 462. *7.* $3450; $10500. *8.* 30 rd.; 90 rd. *9.* $126. *10.* 1240; 3737.

Ex. XCVIII. *1.* $36; $48. *2.* 60 bu. oats; 150 bu. peas. *3.* 17. *4.* $7800; $11700. *5.* 275; 330. *6.* $20; $40; $60. *7.* 30; 45; 75. *8.* 6. *9.* $420; $140; $560. *10.* $10940; $3020; $2450.

Ex. XCIX. *1.* $8; $10; $13. *2.* 170 lb.; 152 lb.; 134 lb. *3.* 150 yd.; 125 yd.; 169 yd. *4.* 2400 lb.; 2200 lb.; 1800 lb. *5.* 127 lb.; 100 lb.; 175 lb. *6.* 60 mi.; 25 mi.; 40 mi. *7.* 81 rd.; 45 rd.; 123 rd. *8.* 256; 378; 452. *9.* $450; $531; $612. *10.* 180 bu.; 233 bu.; 160 bu. *11.* 32 ct. *12.* 87 red, 94 blue, 105 white.

Ex. C. *1.* 1975. *2.* 3683. *3.* 184019. *4.* 7, 10, 9. *5.* 14, 11. *6.* 43, 16. *7.* 14 lb. *8.* 48 yr. *9.* $119. *10.* $7095.

Ex. CI. *1.* 659 lb. 13 oz. *2.* 256 mi. 160 rds. *3.* $204.75. *4.* $17.82. *5.* 35 cwt. 25 lb. *6.* 12 lb. 9 oz. *7.* 33 mi. 96 rd. *8.* 45. *9.* $75. *10.* 24 lb. 10 oz.

Ex. CII. *1.* $32. *2.* 7 ct. *3.* 15 carats. *4.* 40 ct. *5.* 6 ct. *6.* 200 bu. at 75 ct., 300 bu. at 70 ct. *7.* 4 ft. 3 in. *8.* 139 lb. *9.* 1s. 7d. *10.* 4s. 9d.

Ex. CIII. *1.* 272 lb., 2448 lb. *2.* $570940. *3.* 2 oz. *4.* 35 ct. *5.* 22 yr. *6.* $25. *7.* 7 ct. *8.* 46 ct. *9.* $6.60. *10.* 12 carats.

Ex. CIV. *1.* 2, 2, 3; 2, 2, 2, 7; 2, 2, 3, 7; 2, 3, 5. *2.* 2, 2, 7, 7; 3, 7, 11; 2, 2, 3, 3, 7; 2, 2, 2, 2, 2, 2, 2, 3. *3.* 2, 2, 3, 73; 2, 2, 3, 79; 2, 2, 263; 3, 353. *4.* 3, 5, 73; 3, 7, 53; 7, 7, 23; 2, 2, 17, 17. *5.* 2, 601; 2, 607; 2, 3, 7, 29; 5, 311. *6.* 797, 821. *7.* 1187. *8.* 2543, 2521. *9.* 2273, 2339, 2417. *10.* 3119.

Ex. CV. *1.* 2, 5; 5, 7. *2.* 3, 7; 11, 13. *3.* 7, 17; 2, 2, 3. *4.* 2, 2; 2, 2, 3, 3, 3. *5.* 2, 2; 5. *8.* 30; 25; 275; 193; 443. *9.* 2, 3, 5; 3, 5, 7; 5, 7, 11; 7, 11, 13; 11, 17, 19.

Ex. CVI. *1.* 180. *2.* 5. *3.* 6. *4.* 120. *5.* 4. *6.* 1008. *7.* 2400. *8.* 900 bu. *9.* 75 yd. *10.* 40 da.

Ex. CVII. *1.* 14; 16; 13. *2.* 35; 46; 42. *3.* 72; 32; 4. *4.* 9; 16; 7. *5.* 25; 42; 42. *6.* 9; 4; 73. *7.* 73; 32; 11. *8.* 9; 8; 13. *9.* 32; 110; 14. *10.* 91; 143; 323.

Ex. CVIII. *1.* 14 ft. *2.* 17 in. *3.* 15. *4.* 7 ft. *5.* 2 ft. 3 in. *6.* 13 ft. *7.* 63 bu. *8.* \$1, \$2, \$5, \$10, or \$50. *9.* \$124. *10.* 26880 rails.

Ex. CIX. *1.* 18; 7; 251. *2.* 107, 311, 103. *3.* 52, Prime, 601. *4.* 31, 947, 233. *5.* Prime, 47, 811. *6.* 8, 616, 884. *7.* 1188, 13, 13. *8.* 46, 21, 9. *9.* 897, 1323, 1429. *10.* 315, 19.

Ex. CX. *1.* 105; 3, 5, 7, 15, 21, 35, 105. *2.* 2 da. 5 hr. *3.* 1 mi. 37 yd. *4.* 3 gal. *5.* 117. *6.* 29. *7.* 25. *8.* 19 men. *9.* 7 oz. *10.* 126.

Ex. CXI. *1.* 24; 120; 120. *2.* 75; 600; 720. *3.* 315; 2652; 3705. *4.* 360; 1260; 504. *5.* 576; 600; 27720. *6.* 1260; 8415; 16546530. *7.* 10890; 17160; 205205. *8.* 14280; 166320; 22770. *9.* 1190595; 27945372; 885989. *10.* 12018233514; 110250; 620310.

Ex. CXII. *1.* 120. *2.* 360. *3.* 85085. *4.* 6435. *5.* 48. *6.* 143. *7.* 1526. *8.* 90. *9.* 120 ft. *10.* 60 gal.

Ex. CXIII. *1.* \$20. *2.* 141 lb. *3.* 94 lb. *4.* 30. *5.* 30 mi. *6.* 365. *7.* 62, 122, 182. *8.* 600 bu. *9.* 13, 14, 15, 16. *10.* 1008000 gr.

Ex. CXV. *1.* $\frac{5}{2}$; $\frac{13}{3}$; $\frac{13}{5}$; $\frac{19}{4}$. *2.* $\frac{43}{7}$; $\frac{57}{8}$; $\frac{73}{9}$; $\frac{30}{7}$. *3.* $\frac{43}{8}$; $\frac{61}{9}$; $\frac{89}{11}$; $\frac{283}{31}$. *4.* $\frac{55}{3}$; $\frac{79}{4}$; $\frac{43}{2}$; $\frac{128}{5}$. *5.* $\frac{480}{11}$; $\frac{508}{5}$; $\frac{223}{15}$; $\frac{5273}{203}$. *6.* $\frac{2449}{15}$; $\frac{4678}{17}$; $\frac{45664}{99}$; $\frac{8480}{21}$. *7.* $\frac{5191}{25}$; $\frac{68861}{81}$; $\frac{35449}{39}$; $\frac{19725}{251}$. *8.* $\frac{13337}{43}$; $\frac{44399}{78}$; $\frac{69881}{103}$; $\frac{160589}{230}$. *9.* $\frac{17022}{17}$; $\frac{77041}{801}$; $\frac{783827}{97}$; $\frac{707007}{101}$. *10.* $\frac{287747}{41}$; $\frac{498803}{707}$; $\frac{288761}{784}$; $\frac{210867}{5698}$.

Ex. CXVII. *1.* $2\frac{1}{2}$; $2\frac{1}{3}$; $3\frac{1}{4}$; 2. *2.* $1\frac{7}{8}$; $2\frac{5}{7}$; $5\frac{1}{6}$; $2\frac{11}{12}$. *3.* $7\frac{1}{12}$; 5; $5\frac{8}{14}$; $5\frac{6}{17}$. *4.* $9\frac{3}{24}$; $16\frac{21}{23}$; $33\frac{10}{23}$; $35\frac{13}{25}$. *5.* $5\frac{12}{125}$; $4\frac{49}{123}$; $6\frac{72}{151}$; $13\frac{51}{73}$. *6.* $4\frac{960}{1760}$; $260\frac{21}{23}$; $16\frac{63}{323}$; $1\frac{585}{1133}$. *7.* $20\frac{119}{240}$; $9\frac{458}{727}$; $3\frac{1104}{1931}$; $34\frac{791}{2237}$. *8.* $334\frac{2}{23}$; $100\frac{1}{83}$; $10\frac{11}{607}$; $10\frac{37}{353}$. *9.* $20\frac{16}{401}$; $45\frac{7}{9}$ gal.; $53\frac{5}{7}$ da. $50\frac{3}{5}$ lb. *10.* $7\frac{28}{271}$ mi.; $24\frac{20}{31}$ cd.; $21\frac{12}{17}$ yd.; $63\frac{1}{11}$ oz.

Ex. CXVIII. *1.* \$$4\frac{1}{4}$. *2.* $92\frac{1}{4}$ bu. *3.* $4\frac{3}{4}$ mi. *4.* $16\frac{1}{6}$ lb. *5.* $321\frac{1}{3}$ bu. *6.* Latter by $\frac{1}{20}$ lb. *7.* 11 in.; 7 lb.; 25 oz. *8.* $7\frac{1}{2}$ gal. *9.* 20 ft.; 16 ft. *10.* \$19.75.

Ex. CXXII. *1.* $\frac{1}{2}$; $\frac{3}{4}$; $\frac{2}{3}$; $\frac{1}{4}$. *2.* $\frac{7}{15}$; $\frac{3}{5}$; $\frac{7}{8}$; $\frac{4}{7}$. *3.* $\frac{5}{7}$; $\frac{5}{11}$; $\frac{9}{35}$; $\frac{2}{3}$. *4.* $\frac{1}{6}$; $\frac{3}{7}$; $\frac{19}{25}$; $\frac{17}{20}$. *5.* $\frac{2}{5}$; $\frac{1}{3}$; $\frac{5}{7}$; $\frac{63}{149}$. *6.* $\frac{41}{62}$; $\frac{29}{517}$; $\frac{14}{15}$; $\frac{26}{225}$. *7.* $\frac{8}{9}$; $\frac{29}{37}$; $\frac{241}{661}$; $\frac{27}{41}$. *8.* $\frac{54}{101}$; $\frac{2}{3}$; $\frac{653}{19820}$; $\frac{9}{13}$. *9.* $\frac{8}{11}$; $\frac{11}{37}$; $\frac{2}{7}$; $\frac{6539}{12963}$. *10.* $\frac{124}{437}$; $\frac{23}{29}$; $\frac{13}{20}$; $\frac{829}{7337}$.

Ex. CXXIV. *1.* $\frac{80}{180}$, $\frac{75}{180}$, $\frac{84}{180}$; $\frac{42}{98}$, $\frac{35}{98}$, $\frac{8}{98}$.
2. $\frac{125}{150}$, $\frac{24}{150}$, $\frac{35}{150}$; $\frac{52}{286}$, $\frac{110}{286}$, $\frac{77}{286}$.
3. $\frac{84}{144}$, $\frac{20}{144}$, $\frac{33}{144}$; $\frac{18}{114}$, $\frac{15}{114}$, $\frac{19}{114}$.
4. $\frac{216}{252}$, $\frac{147}{252}$, $\frac{80}{252}$, $\frac{39}{252}$; $\frac{36}{90}$, $\frac{60}{90}$, $\frac{20}{90}$, $\frac{63}{90}$.
5. $\frac{30}{72}$, $\frac{68}{72}$, $\frac{69}{72}$, $\frac{14}{72}$; $\frac{63}{84}$, $\frac{60}{84}$, $\frac{32}{84}$, $\frac{34}{84}$.
6. $\frac{420}{720}$, $\frac{405}{720}$, $\frac{468}{720}$, $\frac{440}{720}$; $\frac{88}{120}$, $\frac{102}{120}$, $\frac{70}{120}$, $\frac{95}{120}$.
7. $\frac{500}{1200}$, $\frac{850}{1200}$, $\frac{1080}{1200}$, $\frac{192}{1200}$; $\frac{119}{168}$, $\frac{104}{168}$, $\frac{132}{168}$, $\frac{90}{168}$.
8. $\frac{64}{120}$, $\frac{78}{120}$, $\frac{70}{120}$, $\frac{55}{120}$; $\frac{102}{120}$, $\frac{50}{120}$, $\frac{65}{120}$, $\frac{84}{120}$.
9. $\frac{84}{108}$, $\frac{30}{108}$, $\frac{14}{108}$, $\frac{33}{108}$; $\frac{105}{231}$, $\frac{165}{231}$, $\frac{121}{231}$, $\frac{39}{231}$.
10. $\frac{22}{99}$, $\frac{63}{99}$, $\frac{120}{99}$, $\frac{198}{99}$; $\frac{324}{450}$, $\frac{230}{450}$, $\frac{625}{450}$, $\frac{3150}{450}$.

Ex. CXXV. *8.* $\frac{49}{60}$. *9.* $\frac{71}{84}$. *10.* $\frac{35}{72}$.

Ex. CXXVI. *8.* $\frac{1}{24}$; $\frac{2}{5}$; $\frac{3}{10}$. *9.* $\frac{1}{2}$; $\frac{2}{15}$; $\frac{5}{52}$. *10.* 288, 1024.

Ex. CXXVII. *4.* 2; 1; 2. *5.* 1; 2; $1\frac{9}{14}$. *6.* $1\frac{35}{72}$; $1\frac{67}{90}$; $2\frac{1}{12}$. *7.* $1\frac{59}{84}$; $1\frac{7}{12}$; $2\frac{5}{12}$. *8.* $2\frac{101}{420}$; $1\frac{3}{7}$; $1\frac{173}{216}$. *9.* $\frac{119}{132}$; $2\frac{11}{84}$; $2\frac{129}{440}$. *10.* $1\frac{104}{315}$; $2\frac{17}{120}$; $1\frac{431}{660}$.

Ex. CCXIX. *1.* $1\frac{17}{60}$. *2.* $3\frac{19}{30}$. *3.* $1\frac{73}{336}$. *4.* $4\frac{109}{360}$. *5.* $2\frac{197}{2160}$. *6.* $24\frac{3}{4}$. *7.* $35\frac{7}{11}$. *8.* $17\frac{7}{20}$. *9.* $23\frac{3}{4}$. *10.* $26\frac{19}{20}$.

Ex. CXXX. *1,* $\frac{13}{24}$. *2.* $29\frac{13}{24}$ A. *3.* $111\frac{37}{40}$ lb. *4.* $5\frac{73}{120}$. *5.* $\frac{11}{12}$. *6.* $178\frac{7}{40}$. *7.* $8\frac{3}{7}$. *8.* $21\frac{25}{36}$ mi. *9.* $114\frac{7}{12}$ gal. *10.* $132\frac{1}{2}$ mi.

Ex. CXXXIII. *1.* \$$\frac{7}{20}$. *2.* $\frac{13}{35}$. *3.* $\frac{59}{200}$. *4.* $\frac{23}{60}$. *5.* $\frac{31}{700}$. *6.* $\frac{5}{24}$. *7.* $\frac{11}{120}$. *8.* $\frac{17}{30}$. *9.* $\frac{71}{300}$. *10.* $\frac{7}{20}$.

Ex. CXXXIV. *1.* $3\frac{1}{6}$; $3\frac{5}{11}$; $5\frac{8}{13}$. *2.* $\frac{3}{8}$; $1\frac{1}{14}$; $\frac{17}{144}$. *3.* $\frac{5}{48}$; $5\frac{1}{28}$; $6\frac{4}{363}$. *4.* $3\frac{15}{17}$; $4\frac{9}{11}$; $4\frac{9}{13}$. *5.* $2\frac{1}{2}$; $2\frac{17}{27}$; $1\frac{263}{288}$. *6.* $14\frac{2}{7}$; $23\frac{7}{11}$; $20\frac{2}{15}$. *7.* $1\frac{48}{539}$; $\frac{13}{84}$; $10\frac{133}{140}$. *8.* $26\frac{41}{60}$; $20\frac{25}{36}$; $10\frac{7}{72}$. *9.* $17\frac{35}{72}$; $38\frac{53}{60}$; $31\frac{19}{42}$. *10.* $23\frac{13}{24}$; $12\frac{4}{143}$; $13\frac{14}{75}$.

Ex. CXXXV. *1.* $16\frac{5}{8}$ gal. *2.* $13\frac{5}{6}$ yd. *3.* $16\frac{19}{24}$ mi. *4.* $30\frac{5}{8}$. *5.* \$$95\frac{59}{60}$. *6.* $159\frac{43}{60}$ A. *7.* \$$68\frac{3}{4}$. *8.* $13\frac{1}{10}$. *9.* $15\frac{59}{75}$. *10.* $164\frac{13}{20}$ t.

Ex. CXXXVI. *1.* $\frac{43}{90}$; $1\frac{5}{16}$. *2.* $3\frac{1}{8}$; $8\frac{23}{36}$. *3.* $\frac{101}{110}$; $4\frac{1}{9}$. *4.* 6; $9\frac{7}{18}$. *5.* $4\frac{4}{7}$; $5\frac{19}{27}$. *6.* $1\frac{20}{21}$; $34\frac{8}{9}$. *7.* $11\frac{7}{8}$; $27\frac{41}{54}$. *8.* $2\frac{11}{14}$; $7\frac{5}{16}$. *9.* 10; $11\frac{5}{11}$. *10.* $8\frac{17}{22}$; $1\frac{67}{112}$.

Ex. CXXXVII. *1.* $97\frac{19}{24}$ lb. *2.* $16\frac{1}{2}$ gal. *3.* 54 lb. *4.* $193\frac{41}{56}$. *5.* $33\frac{1}{2}$ miles. *6.* Gained \$$1\frac{3}{20}$. *7.* \$$23\frac{1}{3}$. *8.* \$$94\frac{23}{48}$. *9.* $18\frac{1}{3}$ yd. *10.* $37\frac{23}{24}$ yd.

Ex. CXL. *1.* 4; 9; 8. *2.* $\frac{8}{15}$; $\frac{9}{20}$; $\frac{12}{35}$. *3.* $\frac{25}{42}$; $\frac{12}{35}$; $\frac{21}{32}$.
4. $\frac{20}{63}$; $\frac{28}{143}$; $\frac{40}{69}$. *5.* $\frac{3}{19}$; $\frac{4}{7}$; $4\frac{1}{2}$. *6.* $\frac{6}{7}$; $6\frac{2}{3}$; $5\frac{5}{7}$. *7.* $\frac{3}{40}$: $\frac{3}{4}$; $\frac{15}{32}$.
8. $\frac{9}{10}$; $1\frac{1}{20}$; $\frac{11}{24}$. *9.* $\frac{3}{8}$; $\frac{6}{7}$; $\frac{01}{21}$. *10.* $\frac{5}{6}$; $\frac{94}{103}$; 35.

Ex. CXLI. *1.* $20\frac{1}{4}$; $30\frac{3}{16}$; $56\frac{7}{64}$. *2.* $30\frac{2}{9}$; $42\frac{10}{49}$; $72\frac{12}{49}$.
3. $42\frac{20}{81}$; $56\frac{6}{25}$; $156\frac{15}{64}$. 4. $\frac{1}{4}$; $\frac{8}{13}$; $\frac{4}{11}$. *5.* 15; $16\frac{1}{3}$; $9\frac{4}{5}$.
6. $1\frac{1}{4}$; 11; 20. *7.* $1\frac{1}{5}$; 195; $16\frac{1}{2}$. *8.* $31\frac{1}{9}$; $2\frac{3}{11}$; 1.
9. \$$\frac{7}{12}$; \$$\frac{1}{2}$; 555 mi. *10.* \$558; 324 oz.; 3 hr.

Ex. CXLII. *1.* \$$39\frac{9}{10}$. *2.* \$$159\frac{3}{4}$. *3.* $71\frac{7}{8}$c. *4.* $8\frac{1}{4}$ mi.
5. \$$13\frac{1}{2}$. *6.* $12\frac{3}{5}$ bu. *7.* \$$1733\frac{1}{3}$. *8.* 36 bu. *9.* 47 A. *10.* \$4.

Ex. CXLIII. *1.* \$1.68. *2.* \$30000. *3.* 85 mi. *4.* $37\frac{1}{2}$ ft.
5. 385 mi. *6.* \$105000. *7.* $257\frac{2}{5}$. *8.* 39100 men. *9.* 210 pages.
10. \$65600.

Ex. CXLIV. *1.* $2\frac{1}{2}$; $24\frac{1}{2}$. *2.* 18; $\frac{21}{32}$. *3.* $17\frac{2}{3}$; 7.
4. $3\frac{3}{7}$; $\frac{70}{99}$. *5.* $\frac{5}{11}$; $3\frac{1}{5}$. *6.* 7; 20. *7.* 10; 40. *8.* $2\frac{5}{8}$; $\frac{1}{10}$.
9. $35\frac{3}{5}$; $\frac{1}{2}$. *10.* 1; $2\frac{3}{15}$.

Ex. CXLV. *1.* $185\frac{5}{8}$ mi. *2.* \$1012. *3.* $59\frac{3}{8}$. *4.* $32\frac{13}{14}$ bu.
5. \$$17086\frac{2}{3}$. *6.* 10. *7.* $37\frac{53}{105}$. *8.* \$3125. *9.* \$$43\frac{5}{8}$. *10.* Gain, \$12.

Ex. CXLVI. *1.* 14, 16, 15. *2.* 36, 55, 44. *3.* $8\frac{3}{4}$, $14\frac{2}{5}$, $24\frac{3}{4}$.
4. $17\frac{1}{7}$. $31\frac{1}{4}$, $30\frac{6}{7}$. *5.* $4\frac{4}{7}$, $5\frac{5}{14}$, $6\frac{6}{23}$. *6.* $6\frac{12}{19}$, $7\frac{19}{23}$, $11\frac{21}{25}$.
7. $5\frac{5}{9}$, 4, $7\frac{1}{2}$. *8.* $1\frac{1}{20}$, $1\frac{1}{35}$, $\frac{35}{36}$. *9.* $1\frac{5}{27}$, $2\frac{1}{4}$, $1\frac{3}{5}$. *10.* 3, $\frac{1}{2}$, $1\frac{1}{8}$.

Ex. CXLVII. *1.* $1\frac{2}{3}$; $\frac{12}{35}$, $1\frac{1}{6}$. *2.* $1\frac{1}{8}$, $\frac{15}{16}$, $\frac{3}{10}$. *3.* $1\frac{1}{27}$, $1\frac{1}{2}$, $1\frac{2}{7}$.
4. $\frac{2}{5}$, $\frac{2}{3}$, $\frac{5}{7}$. *5.* $\frac{10}{11}$, $1\frac{3}{7}$, $\frac{3}{10}$. *6.* $3\frac{1}{18}$, $1\frac{5}{7}$, $1\frac{1}{54}$. *7.* $2\frac{1}{2}$, 6, 8.
8. $3\frac{1}{2}$, $\frac{9}{11}$, $3\frac{1}{3}$. *9.* $1\frac{29}{40}$, $\frac{3}{4}$, 2. *10.* $7\frac{5}{7}$, $1\frac{5}{11}$, $5\frac{1}{4}$.

Ex. CXLVIII. *1.* $37\frac{1}{2}$ yd. *2.* $8\frac{2}{5}$ mi. *3.* \$$26\frac{1}{4}$. *4.* $17\frac{2}{5}$ mi.
5. 10 bags. *6.* $12\frac{1}{2}$ ct. *7.* $28\frac{2}{3}$ hr. *8.* $8\frac{23}{29}$. *9.* $217\frac{1}{2}$ A.
10. $370\frac{1}{2}$ A. *11.* $15\frac{1}{3}$ ct. *12.* 32 da. *13.* \$3.60. *14.* 20.

Ex. CXLIX. *1.* $7\frac{4}{7}$, 4. *2.* $3\frac{1}{2}$, $3\frac{3}{5}$. *3.* $2\frac{18}{41}$, 12. *4.* $\frac{7}{8}$, $\frac{7}{29}$.
5. $8\frac{1}{7}$, $\frac{25}{399}$. *6.* $\frac{5}{7}$, $2\frac{26}{35}$. *7.* $4\frac{1}{2}$, $\frac{8}{115}$. *8.* $23\frac{5}{8}$, 16. *9.* $\frac{1}{60}$, $\frac{1}{16}$.
10. $36\frac{27}{68}$, $\frac{16}{187}$.

Ex. CL. *1.* $\frac{2}{15}$, $3\frac{1}{3}$. *2.* $3\frac{1}{3}$, 30. *3.* 54, $66\frac{2}{3}$. *4.* 6, $\frac{15}{56}$.
5. $\frac{23}{90}$, $\frac{7}{64}$. *6.* $\frac{9}{10}$, $2\frac{4}{7}$. *7.* $\frac{1}{6}$, $5\frac{1}{3}$. *8.* $10\frac{1}{12}$, $\frac{3}{4}$. *9.* $5\frac{17}{44}$, $\frac{3}{4}$.
10. $\frac{45}{88}$, $\frac{55}{512}$.

Ex. CLI. *1.* $5\frac{5}{6}$, $\frac{1}{8}$. *2.* $1\frac{1}{3}$, $1\frac{1}{2}$. *3.* $1\frac{7}{13}$, $1\frac{1}{2}$. *4.* $\frac{20}{21}$, $\frac{13}{31}$.
5. $\frac{11}{91}$, $\frac{3}{17}$. *6.* 1, $\frac{14}{17}$. *7.* $2\frac{1}{5}$, $3\frac{5}{9}$. *8.* 7, $\frac{1}{6}$. *9.* $1\frac{1}{2}$, 40. *10.* $\frac{1}{3}$, 2.

Ex. CLII. *1.* $144\frac{3}{8}$. *2.* 2. *3.* $1\frac{4}{93}$. *4.* $\frac{2}{5}$. *5.* $7\frac{1}{2}$. *6.* $4\frac{7}{10}$.
7. $15\frac{1}{2}$. *8.* $43\frac{5}{12}$. *9.* $\frac{6}{25}$. *10.* 4.

Ex. CLIII. *1.* $\frac{11}{12}$. *2.* 4. *3.* $6\frac{13}{75}$. *4.* $\frac{19}{20}$. *5.* 2. *6.* 35.
7. $10\frac{2}{3}$. *8.* $1\frac{1}{2}$. *9.* $1\frac{13}{36}$: $\frac{19}{36}$; $\frac{85}{216}$; $2\frac{4}{15}$. *10.* $\frac{3}{5}$.

Ex. CLIV. *1.* $\frac{5}{23}$; $\frac{30}{23}$. *2.* $\frac{7}{135}$; $\frac{28}{9}$. *3.* $\frac{2}{45}$; 60. *4.* $2\frac{3}{10}$ ft.
5. $5\frac{5}{9}$ ft.; 19. *6.* 60. *7.* \$$112\frac{1}{2}$. *8.* $3\frac{3}{8}$ bu., 51 bags. *9.* 59.
10. $6\frac{2}{3}$ da; A, 10 times; B, 15 times; C, 8 times.

Ex. CLV. *1.* 16s., $3\frac{1}{2}$d., $4\frac{1}{2}$d. *2.* $87\frac{1}{2}$ ct., 80 ct., 75 ct.
3. 17 cwt. 50 lb., 7 lb. 8 oz., 14 oz.
4. 213 rd. 1 yd. 2 ft. 6 in., 3 yd. 2 in., 2 ft. 6 in.
5. 128 sq. rd., 22 sq. yd., 2 sq. ft. 117 sq. in.

6. 96 c. ft., 11 c. ft., 432 c. in., 504 c. in.
7. 2 pk. 1 gal., 1 gal. $1\frac{1}{3}$ qt., 3 qt. *8.* 3 qt. 1 pt., $1\frac{1}{2}$ pt., $3\frac{1}{5}$ qt.
9. 4 da. 21 hr. 36 min., 7 hr., 25 min. *10.* 40′, 288°, 16″ 40″.

Ex. CLVI. *1.* 444546 in., 126744 in.
2. 1 mi. 131 rd. 4 yd. 2 ft. 6 in., 1 mi. 179 rd. 1 ft. 6 in.
3. 237600 in. $1559\frac{1}{4}$ in. *4.* 31637628 sq. in., 3860136 sq. in.
5. 1 A. 52 sq. rd. 19 sq. yd. 8 sq. ft., 2 A. 47 sq. rd. 9 sq. yd. 3 sq. ft. 36 sq. in.
6. 16727040 sq. in., 131868 sq. in. *7.* 9600 lb., 3800 oz.
8. 145 rd. 2 yd. 1 ft. 6 in., 93 sq. yd., 10 sq. yd. 108 sq. in.
9. 9 A. 120 sq. rd. 22 sq. yd., 1 A. 16 sq. rd. 9 sq. yd., 3 sq. ft.
10. 200 gal., 35 t.

Ex. CLVII. *1.* $82.11, $28.80. *2.* £1 5s. $3\frac{3}{4}$d., £1 2s. 8d.
3. 3 t. 12 cwt. 4 lb., 1 t. 11 cwt. 48 lb.
4. 2 mi. 197 rd. 5 yd. 9 in., 2 mi. 270 rd. $4\frac{4}{5}$ in.
5. 1 A. 135 rd. 22 yd. 8 ft. $5\frac{1}{7}$ in., 2 A. 16 rd.
6. 2 cd. 59 cu. ft., 10 cd. 60 c. ft. *7.* 3 bu. $\frac{1}{9}$ gal., 2 bu. 0 pk. 4 qt.
8. 5 gal., 13 gal. 1 pt. *9.* 23 hr. 20 min., 5 hr. 26 min. 40 sec.
10. 10° 30′ 12″, 14° 30′ 30″.

Ex. CLVIII. *1.* $\frac{3}{400}$ cwt. *2.* £$\frac{1}{360}$. *3.* $\frac{1}{12}$ bu.
4. $\frac{4}{55}$ rd. *5.* $\frac{1}{396}$ rd. *6.* $\frac{3}{5}$ pt. *7.* $\frac{3}{2}$ oz. *8.* $\frac{10}{13}$.
9. $\frac{5}{11}$. *10.* $\frac{1}{3}$ ft.

Ex. CLIX. *1.* $\frac{8}{9}$ lb. *2.* $\frac{1}{128}$. *3.* $\frac{103}{440}$ mi. *4.* $\frac{4}{13}$.
5. $\frac{41}{180}$. *6.* $\frac{5}{18}$ cu. yd. *7.* $\frac{71}{84}$. *8.* $\frac{1}{9}$ mi. *9.* $\frac{144}{175}$.
10. $\frac{7}{13}$ A.

Ex. CLX. *1.* 34940585. *2.* 525 lb. *3.* 169 qt. *4.* $55756\frac{4}{5}$.
5. 4320. *6.* 5940. *7.* $251.25. *8.* \$$1837\frac{1}{2}$. *9.* $44.20. *10.* $300.

Ex. CLXI. *1.* 118188 lb. *2.* $31\frac{1}{2}$ cd. *3.* $150. *4.* $3.84.
5. $633.60. *6.* 267 d. *7.* 129600 min. *8.* 1440 min. *9.* $21.51.
10. 2024 poles.

Ex. CLXII. *1.* 47 lb. *2.* 36112 pt. *3.* 5392 oz. *4.* 31 t. 5 cwt.
5. 1800. *6.* $499.95. *7.* 1248 oz. *8.* 40 ct. *9.* 189. *10.* 46772 lb.

Ex. CLXIII. *1.* 22506 gr. *2.* 161 gr. *3.* $5\frac{17}{120}$ oz. *4.* 5184 gr.
5. 11088 gr. *6.* 10 lb. 1 oz. 12 dwt. 8 gr. *7.* 25. *8.* $37\frac{1}{2}$ lb.
9. 701 lb. 6 oz. 6 dwt. 5 gr. *10.* $114\frac{27}{32}$ lb.

Ex. CLXIV. *1.* 63360 in. *2.* 8064 in. *3.* 2 mi. *4.* $462.
5. $422.40. *6.* $500. *7.* 10 hr. 17 min. *8.* 1584000 in.
9. 506898 in. *10.* 440 mi.

Ex. CLXV. *1.* $72. *2.* $31.50. *3.* $1.95. *4.* 438 baskets.
5. 335 pt. *6.* $1.05. *7.* 4. *8.* $510.30. *9.* 2 qt. *10.* \$$137.74\frac{1}{2}$.

Ex. CLXVI. *1.* 32 da. *2.* 264 ft. *3.* 9. *4.* 44 ft. *5.* 9 mi.
6. 320 hr. *7.* 500 da. *8.* $57.24. *9.* $47.25. *10.* $19.44.

Ex. CLXVII. *1.* 68 ct. *2.* 5 ft. *3.* 8184. *4.* 15. *5.* 43 mi.
6. 48 hr. *7.* 4620 paces. *8.* 43. *9.* 24320. *10.* $8\frac{35}{44}$ mi.

Ex. CLXVIII. *1.* 6 lb. 4 oz. 8 dwt. 12 gr. *2.* £200.
3. 10 cwt. 80 lb. 1 oz. *4.* 24 ft. *5.* 990 yd.
6. 4 min. 16 sec.; 980 yd. *7.* 32 yd. *8.* 54. *9.* 989 lb. *10.* 1271.

Ex. CLXIX. *1.* 84 in. *2.* 7 da. *3.* 506 da. *4.* 66 mi.
5. 75 ct. *6.* $8050.50. *7.* $49\frac{7}{8}$ yd. *8.* 60 ct.
9. 12 da. 20 hr. 20 min. *10.* 4 yd. 1 ft. 3 in.

Ex. CLXX. *1.* 3 lb. 11 oz. 11 dwt. 6 gr. *2.* 9. *3.* 12 hr.
4. 110 da. *5.* 36 hr. *6.* 42. *7.* 92928. *8.* 12 spoons. *9.* $5\frac{1}{22}$ mi.
10. £43 1s. 3d.; £6 8s. 9d.

Ex. CLXXI. *1.* 209 bu. 1 pk. 3 qt. *2.* 1569 bbl.
3. A, $13\frac{3}{4}$ yd.; B, $19\frac{1}{4}$ yd. *4.* 36 mi. 298 rd. 1 ft. 6 in.
5. 48 rd. *6.* $8\frac{4}{7}$ yd. *7.* $62. *8.* $13.50. *9.* $432. *10.* $14\frac{7}{8}$ t.

Ex. CLXXII. *1.* $7.50. *2.* $1.76. *3.* $96. *4.* $49. *5.* $19.12.
6. $27\frac{1}{5}$ yd. *7.* 27 lb. *8.* 10 hr. *9.* 8.92\frac{1}{2}$. *10.* $94.40, $660.80.

Ex. CLXXIII. *1.* 48, 8 lb. *2.* 32 lb. *3.* 42 mi. *4.* 24 yd.
5. 450 sheep. *6.* 176 ft. *7.* $58\frac{2}{5}$ A. *8.* 60 ct. *9.* $12000. *10.* $\frac{39}{40}$ A.

Ex. CLXXIV. *1.* 288. *2.* $68. *3.* $160\frac{2}{3}$ bu., $321\frac{1}{3}$ bu. *4.* 20\frac{1}{4}$.
5. $6000. *6.* $8\frac{1}{4}$ ft., $2079\frac{11}{16}$ gal. *7.* $23.76. *8.* 100 A. *9.* $4070.
10. $6250.

Ex. CLXXV. *1.* 50 A. 156 rd. *2.* 7 ft. 9 in. *3.* $8\frac{2}{3}$ ft.
4. 3 doz. *5.* $181\frac{17}{80}$ A., $203\frac{47}{80}$ A. *6.* 38 A. $91\frac{1}{4}$ rd. *7.* 42240.
8. $66.01. *9.* 396 lots. *10.* $13459.56; James, $3364.89; William,
$4486.52; daughter, $1121.63; wife, $4486.52.

Ex. CLXXVI. *1.* $\frac{9}{20}$. *2.* $\frac{5}{12}$. *3.* $1\frac{1}{3}$ da. *4.* 36 da. *5.* $16\frac{4}{5}$ da.
6. $41\frac{1}{4}$ da. *7.* 10 da. *8.* $1\frac{13}{47}$ da. *9.* $2\frac{6}{17}$ da. *10.* $1\frac{26}{59}$ da. *11.* $21\frac{3}{17}$ da.
12. $5\frac{1}{3}$ hr. *13.* $28\frac{4}{7}$ hr. *14.* $6\frac{18}{29}$ da. *15.* $2\frac{4}{9}$ da. *16.* $3\frac{29}{31}$ da.

Ex. CLXXXI. *1.* 282.405 A. *2.* 307222.086446.
3. 363.536487. *4.* 115.8125 yd. *5.* 24.2675 t. *6.* 25269.111505.
7. .42951303. *8.* 6.5 t. *9.* 138.122427. *10.* 48095.139833.

Ex. CLXXXIV. *1.* 72.927. *2.* .1993. *3.* 364.9953.
4. 6999.9996045. *5.* 999999.999999. *6.* .017481.
7. 2999999.900001. *8.* .000999. *9.* 43.08997. *10.* 6929.95993.

Ex. CLXXXV. *1.* 30.280965. *2.* 75.0665. *3.* 15.635563.
4. 16.6799884. *5.* 49.156. *6.* 4.152. *7.* 81.143. *8.* 9.7597.
9. 80.025. *10.* 9.0897.

Ex. CLXXXVI. *1.* 228.475 A. *2.* $327.065. *3.* 199.35 mi.
4. $963.68. *5.* 262.35 A. *6.* .08 in. *7.* $111.58. *8.* 29569.92 A.
9. 123.325 lb. *10.* 73.73 ft. *11.* .3. *12.* 30.338 in.

Ex. CLXXXVIII. *1.* .435; .0676. *2.* 506.4463; 35.4367519.
3. .013272; 32.5779. *4.* 36.9; 1.7005. *5.* 3.8; 1860.867.
6. 525; 92.7. *7.* 11221.1; 54.706. *8.* 9.06453; 279.29475.
9. .000000027; 4.8. *10.* .1728; .032.

Ex. CLXXXIX. *1.* 1234.56, 12345.6, 123456. *2.* 33.5175.
3. .000019737. *4.* .00365. *5.* 005162. *6.* 45; 450; 4500; 45000.
7. 421000. *8.* 1144.90001605. *9.* .68785. *10.* .0000000000884.

Ex. CXC. *1.* 204.375 mi. *2.* 453.125 lb. *3.* $7000.
4. 270.465 ft. *5.* 864.86 ft. *6.* 23.625 yr. *7.* 436247.424 gr.
8. 590.628 mi. *9.* 993.125 gal. *10.* 297.25375.

Ex. CXCIII. *1.* 15.24. *2.* 350000. *3.* .413. *4.* 330000.
5. .024. *6.* 64753000000. *7.* 12.345, 1.2345, .12345, .012345.
8. 10.5. *9.* 127.4. *10.* .075, .0075, .00075.

Ex. CXCIV. *1.* 6.165 rd. *2.* 320 rd. *3.* 42 bu.
4. 144 bbl. *5.* 87.5 bbl. *6.* $128.50. *7.* $27.5. *8.* $10800.
9. 15.75 bu. *10.* 5.2 hr.

Ex. CXCVII. *1.* 15s. $9\frac{3}{4}$d.; 15s. $3\frac{3}{4}$d.; £1 16s. $2\frac{1}{4}$d.
2. 83 lb. 4 oz.; 1 cwt. 74 lb. 14.4 oz.; 3 t. 17 cwt. 95 lb.
3. 252 rd.; 80 rd. 4 yd. 1.2 ft.; 21 mi. 118 rd.
4. 145 sq. rd. 6 sq. yd. 64.8 sq. in.; 141 sq. rd.; 13 A. 70 sq. rd.
5. 25 cu. ft. 540 cu. in.; 7d. 112 cu. ft.; 9 cu. yd. 20 cu. ft. 432 cu. in.
6. 3 pk. 1 gal.; 2 bu. 1 pk. 1 gal.; 5 bu. 1 pk. 1 gal. 3.2 qt.
7. 3 qt. 1 pt.; 5 gal. 1.4 pt.; 7 gal. 3 qt.
8. 11 hr. 52 min. 48 sec.; 7 wk. 6 da. 3 hr.; 9 wk. 6 da. 15 hr. 36 min.
9. 58′ 30″; 2° 50′ 51″; 17° 23′ 15″.
10. 3 ft. 9 in.; 17 rm. 17 qr. 12 sh.; 7 gro. 9 doz.

Ex. CXCVIII. *1.* £1.525, £7.68125. *2.* 9.854 t., 5.70375 t.
3. 7.1109375 mi., 6.089 mi. *4.* 9.3 A., 7.283 A.
5. 7.875 cd., 7.6875 cu. yd. *6.* 7.8125 bu., 5.890625 bu.
7. 27.875 gal., 14.375 gal. *8.* 3.55875 da., 2.7725 wk.
9. 3.8775°, 17.12375°. *10.* 5.8875 rm., 24.75 grs.

Ex. CXCIX. *1.* $3380. *2.* 10.3826 ft. *3.* $59.375.
4. The latter, 8.875 cu. in. *5.* 3.2 lb. *6.* $24.80. *7.* 83.75 yd.
8. $322.28. *9.* 199218.75 oz. *10.* $186.15.

Ex. CC. *1.* $414. *2.* $109.0625. *3.* 75 sheep. *4.* $161.655.
5. 50. *6.* $492.61875. *7.* 3720. *8.* $53.25. *9.* $4. *10.* 13.378 A.

Ex. CCI. *1.* 67.75 A. *2.* 28 yr. *3.* $26484. *4.* 7.39, 8.95.
5. $10.32. *6.* Gain, $846.875, $12.50. *7.* A., $75.87; B., $57.39.
8. 16.5. *9.* 1585584 cu. ft. *10.* 8.6328 mi., 9.1872 mi.

Ex. CCII. *1.* $5. *2.* $96.768. *3.* 29.83 in. *4.* 2.7 ft.
5. 2.2968. *6.* .5625, 33.75. *7.* 15360. *8.* 58 lb. *9.* $24.60.
10. $192.78.

Ex. CCIII. *1.* 42.34. *2.* 17.3. *3.* 8.45, 5.65.
4. 26.1 cd., 24.65 cd. *5.* 64 mi., 56.25 mi. *6.* $340.05.
7. $18.8325. *8.* .7875. *9.* 4 ft. 3.2 in. *10.* 92.4 yd.
11. $181.50, $77, $44. *12.* 660 ft. *13.* 2446.875 lb. *14.* $4\frac{2}{13}$ da.

Ex. CCVII. *1.* 444 sheep. *2.* $103. *3.* 225 bales.
4. 288 boxes. *5.* $216. *6.* 480 A. *7.* 120 lb. *8.* 200 A.
9. 300. *10.* 30 bu.

Ex. CCVIII. *1.* $1400. *2.* $7760. *3.* 120 A. *4.* $3375. *5.* $29500. *6.* 4930 sheep. *7.* 231 girls. *8.* 20277. *9.* $717.25. *10.* 73%, 876 sheep.

Ex. CCIX. *1.* $66\frac{2}{3}\%$. *2.* 98%. *3.* 80%. *4.* 50%. *5.* 20%. *6.* 12%. *7.* 25%. *8.* 8%. *9.* $33\frac{1}{3}\%$. *10.* 40%, 60%.

Ex. CCX. *1.* 70. *2.* $2500. *3.* $500. *4.* 800 A. *5.* 450 sheep. *6.* $4500. *7.* 150 lines. *8.* $1300. *9.* 4500 sheep. *10.* 450 pupils.

Ex. CCXI. *1.* 3290 bu. *2.* 6%. *3.* $72. *4.* $20. *5.* $12932.50. *6.* 48992 lb. *7.* $125. *8.* $5400. *9.* $9000. *10.* Lost, $12\frac{1}{2}\%$.

Ex. CCXII. *1.* 330 rd. *2.* $372. *3.* 10 lb. *4.* 48 mi. *5.* 2800 books. *6.* 224 men. *7.* 1880, 2021. *8.* $11\frac{2}{3}\%$. *9.* 13752. *10.* $9\frac{1}{11}\%$.

Ex. CCXIII. *1.* $112.50; $216. *2.* $292; $504. *3.* $108. *4.* $105. *5.* $180. *6.* $150 *7.* $4\frac{1}{2}\%$; $37\frac{1}{2}\%$. *8.* $360. *9.* $800. *10.* $3.75.

Ex. CCXIV. *1.* $270, $540, $547.20, $1051.65. *2.* $557.46. *3.* $10.26. *4.* $3.20. *5.* $25. *6.* $\$6\frac{2}{3}$. *7.* $500. *8.* $2.50. *9.* $32\frac{1}{2}\%$. *10.* 46%.

Ex. CCXV. *1.* $25.50. *2.* $3.20. *3.* 28%. *4.* 46.19%. *5.* $20. *6.* $7.56. *7.* $850. *8.* $\$33\frac{1}{3}\%$. *9.* $461.70. *10.* $357, $47\frac{1}{2}\%$.

Ex. CCXVI. *7.* 25%. *8.* 15%. *9.* 4%. *10.* $42\frac{6}{7}$.

Ex. CCXVII. *1.* $1.89. *2.* $926.10. *3.* $38.28. *4.* $3612.50. *5.* $238. *6.* $2719.50. *7.* $60. *8.* $900. *9.* 9000 bu. *10.* $4.20.

Ex. CCXVIII. *1.* $112. *2.* $8600. *3.* $204.70. *4.* $1007.50. *5.* $75. *6.* $12\frac{1}{2}\%$. *7.* $330. *8.* 40%. *9.* $35\frac{5}{17}$. *10.* $160, $208.

Ex. CCXIX. *3.* $168.75. *4.* $115.92. *5.* $12.50. *6.* $19.38. *7.* $13.50. *8.* 3%. *9.* $1\frac{1}{2}\%$. *10.* $3\frac{2}{5}\%$.

Ex. CCXX. *1.* 3%. *2.* $2\frac{1}{2}\%$. *3.* $3\frac{1}{3}\%$. *4.* $14400. *5.* $8400. *6.* $2592.80. *7.* 84 ct. *8.* $7200, $216. *9.* 156 members. *10.* $3264.

Ex. CCXXI. *1.* $150. *2.* $3650, $146. *3.* $270. *4.* 25000 yd. *5.* 6000 lb. *6.* 4100 lb. *7.* 52000 yd. *8.* $3500. *9.* $897.75. *10.* $4000.

Ex. CCXXII. *2.* $80. *3.* $66.25. *4.* $225. *5.* $675, $74325. *6.* $22.50. *7.* $1\frac{3}{4}\%$. *8.* $\frac{3}{4}\%$. *9.* $\frac{7}{8}\%$. *10.* $\frac{7}{8}\%$.

Ex. CCXXIII. *1.* $16000. *2.* $3000. *3.* $20000. *4.* $14000. *5.* $420. *6.* $34737.50. *7.* $40000. *8.* $2040, $5960. *9.* $75. *10.* $2500, $3500, $4000.

Ex. CCXXIV. *1.* \$54. *2.* \$150. *3.* \$19.50. *4.* \$525. *5.* \$652.50. *6.* \$22. *7.* \$18. *8.* 14 mills. *9.* $12\frac{1}{2}$ mills. *10.* $17\frac{1}{2}$ mills.

Ex. CCXXV. *1.* \$2800. *2.* \$2500. *3.* \$544000. *4.* \$101.60. *5.* \$2500. *6.* \$13000. *7.* \$5675. *8.* $6\frac{1}{4}$ mills. *9.* \$25. *10.* \$114.20.

Ex. CCXXVI. *1.* \$6, \$8, \$3, \$7, \$7, \$9. *2.* \$9. *3.* \$56. *4.* \$340. *5.* \$10. *6.* \$5.39. *7.* \$15.12. *8.* \$38.88. *9.* \$13.20. *10.* \$4.6116.

Ex. CCXXVII. *1.* \$915.60. *2.* \$1012.65. *3.* \$2084.02. *4.* \$674.01. *5.* \$531.65. *6.* \$425.656. *7.* \$1859.04. *8.* \$66. *9.* \$1910.20. *10.* \$1154.64.

Ex. CCXXVIII. *1.* 6%. *2.* 7%. *3.* $4\frac{1}{2}$%. *4.* $6\frac{2}{3}$%. *5.* $6\frac{1}{4}$%. *6.* $5\frac{1}{2}$%. *7.* $7\frac{1}{2}$%. *8.* $4\frac{1}{2}$%. *9.* 6%. *10.* 6%.

Ex. CCXXIX. *1.* 1 yr. *2.* $1\frac{1}{2}$ yr. *3.* $1\frac{1}{4}$ yr. *4.* 5 mo. *5.* 9 mo. *6.* 8 mo. *7.* 115 da. *8.* $1\frac{1}{4}$ yr. *9.* 150 da. *10.* 75 da.

Ex. CCXXX. *1.* \$540. *2.* \$655. *3.* \$850. *4.* \$360. *5.* \$840. *6.* \$750. *7.* \$876. *8.* \$1825. *9.* \$219. *10.* \$2920.

Ex. CCXXXI. *1.* \$250. *2.* \$465. *3.* \$540. *4.* \$572.50. *5.* \$1320. *6.* \$408. *7.* \$750. *8.* \$1742. *9.* \$3650. *10.* \$3212.

Ex. CCXXXII. *1.* \$126.10, \$926.10. *2.* \$477.54, \$2977.54. *3.* \$76.51, \$1326.51. *4.* \$1724.05, \$9724.05. *5.* \$11255.09. *6.* \$5250. *7.* \$960. *8.* \$10000. *9.* \$4.32. *10.* \$124.05.

Ex. CCXXXIII. *5.* \$751.875. *6.* \$1485.15.

Ex. CCXXXIV. *1.* \$645.48. *2.* \$792.22. *3.* \$180.50. *4.* \$5579.42. *5.* \$508.69. *6.* \$115.48. *7.* \$325. *8.* \$576. *9.* \$1926.70. *10.* \$1053.77.

Ex. CCXXXV. *1.* \$7828. *2.* \$6760. *3.* \$7032.50. *4.* \$1248. *5.* \$2669. *6.* \$4750. *7.* \$3262.50. *8.* \$9750. *9.* \$20400. *10.* \$2600.

Ex. CCXXXVI. *1.* \$700. *2.* \$2500. *3.* \$3500. *4.* \$5600. *5.* \$2200. *6.* 5. *7.* 10. *8.* 6. *9.* 28. *10.* 15.

Ex. CCXXXVII. *1.* \$200. *2.* \$240. *3.* \$200. *4.* \$100. *5.* \$112. *6.* $5\frac{3}{5}$%. *7.* $4\frac{4}{9}$%. *8.* 5%. *9.* $5\frac{1}{3}$%.

Ex. CCXXXVIII. *1.* \$9100. *2.* \$13310. *3.* \$11340. *4.* \$15570. *5.* \$11495. *6.* 60. *7.* 70. *8.* 220. *9.* 500.

Ex. CCXXXIX. *1.* \$16000. *2.* 124. *3.* \$18000; 720. *4.* 8%. *5.* 7%. *6.* $3\frac{1}{2}$%. *7.* \$100. *8.* \$540. *9.* \$4925.

Ex. CCXL. *1.* $114\frac{2}{7}$. *2.* $83\frac{1}{3}$. *3.* $266\frac{2}{3}$. *4.* $5\frac{1}{3}$%. *5.* \$2400. *6.* $\$1426\frac{1}{4}$. *7.* 50. *8.* \$29400. *9.* 5%. *10.* \$5400.

Ex. CCXLI. *4.* 3 mo. *5.* 10 mo. *6.* 8 da. *7.* 60 days after the debt is due. *8.* 6 mo. *9.* 62 da.

Ex. CCXLII. *1.* 6 mo., 3 mo., 4 mo. *2.* 120 da. *3.* 4 mo. *4.* 5 mo. *5.* Ap. 23. *6.* $112\frac{1}{2}$ da. *7.* $3\frac{1}{2}$ mo. *8.* 70 da. *9.* 8 mo.

Ex. CCXLIII. *1.* B, \$450; A, \$600. *2.* A, \$189; B, \$243. *3.* A, \$135; B, \$125. *4.* A, \$85; B, \$130; C, \$60. *5.* A, \$864; B, \$408; C, \$1152. *6.* A, \$2600; B, \$3400. *7.* B, \$650; C, \$925. *8.* A, \$1750; B, \$2125; C, \$1125. *9.* \$720. *10.* A, \$2662; B, \$2420; C, \$2200; D, \$2000.

Ex. CCXLIV. *1.* A, \$17.50; B, \$22.50. *2.* A, \$285; B, \$450. *3.* A, \$25; B, \$21; C, \$54. *4.* A, \$75; B, \$175; C, \$330. *5.* Equally. *6.* A, \$2200; B, \$3000. *7.* A, \$1225; B, \$875; C, \$1050. *8.* 4 mo. *9.* \$1480. *10.* A, \$8445.94; B, \$4054.05. *11.* \$4800. *12.* C, $\$1605\frac{15}{17}$; D, $\$1544\frac{2}{7}$; E, \$1050.

Ex. CCXLVII. *7.* 80; 15625; .512; 343. *8.* 6th. *9.* 256. *10.* 24th. *11.* 49126081. *12.* 128787625000. *13.* .000000000016. *15.* 10 A.

Ex. CCXLVIII. *9.* 3.05; .102; .571; .00563. *10.* 2.236; .707; .948; .094.

Ex. CCXLIX. *1.* 490. *2.* $49\frac{1}{2}$. *3.* 3202. *4.* 24 yd. *5.* 440 yd. *6.* 200 rd. *7.* 272 ft. *8.* \$160. *9.* 144 rd. *10.* \$324.

Ex. CCL. *1.* 75 yd., 25 yd. *2.* 220 yd., 44 yd. *3.* $1\frac{1}{2}$ in. *4.* 17 rd. *5.* 1440 rails. *6.* 280 rd. *7.* 8030 yd. *8.* 15 ft. *9.* 221 yd. *10.* 7712 yd.

Ex. CCLI. *9.* .1; .06; 11.6; 36.3. *10.* .928; .4308; .2; 1.709.

Ex. CCLII. *3.* 35.3. *4.* 5476 sq. ft. *5.* 56454 sq. ft. *6.* 17 ft. *7.* 60 in. *8.* 9.2 in. *9.* 12 ft. *10.* 15.75 in. *11.* 37 ft. *12.* 5 ft. *13.* 12. *14.* 36 ft.

Ex. CCLIII. *1.* 1521 sq. yd. *2.* 29 sq. ft. 56 sq. in. *3.* 1144 sq. ft. *4.* 210 ft. *5.* 2 ch. 40 l. *6.* (*a*) $229\frac{1}{2}$ sq. in. (*b*) .54 A. (*c*) $26\frac{2}{3}$ sq. ft. *7.* $5\frac{5}{12}$ sq. ft. *8.* 16 rd. *9.* 80 rd. *10.* \$50.

Ex. CCLIV. *1.* (*a*) 186 sq. ft. (*b*) $318\frac{55}{72}$ sq. ft. (*c*) $5\frac{9}{40}$ A. (*d*) $7\frac{3}{10}$ A. *2.* 50 in. *3.* 57 in. *4.* 92 rd. *5.* 4300 sq. ft. *6.* 2145 sq. yd. *7.* 1715 sq. ft. *8.* $554\frac{2}{3}$ sq. yd. *9.* 203 sq. ft. *10.* 56 ft.

Ex. CCLV. *1.* 44 in.; 66 in.; 11 ft.; $51\frac{1}{3}$ ft.; $73\frac{1}{3}$ ft.; 14 ch. 96 l. *2.* 7 in.; $17\frac{1}{2}$ in.; $19\frac{1}{4}$ ft.; 1 ch. $71\frac{1}{2}$ l.; 7 yd.; 21 yd. 7 in. *3.* $24\frac{1}{2}$ min. *4.* 111 rd. 1 ft. 10 in. *5.* 5 ft. *6.* 72. *7.* $41\frac{1}{7}$ ft. *8.* 84 yd. *9.* 12 ft. 10 in. *10.* 22 in.; 33 in.; 55 in.; 66 in.; 110 in.; 121 in.

Ex. CCLVI. *1.* $962\frac{1}{2}$ sq. in.; 1386 sq. in.; 3850 sq. in.; 5544 sq. in.; $8662\frac{1}{2}$ sq. in.; 154 sq. in.; $346\frac{1}{2}$ sq. in.; $471\frac{5}{8}$ sq. in.; $962\frac{1}{2}$ sq. in.; 7546 sq. ft.; 154 sq. in.; $38\frac{1}{2}$ sq. ft.; $68\frac{4}{9}$ sq. ft.; $86\frac{5}{8}$ sq. ft.; 1386 sq. ch.
2. $26\frac{53}{72}$ sq. yd. *3.* 88 rd. *4.* 59.4 in. *5.* 308 sq. in.
6. 62.04 yd. *7.* 246.66 yd. *8.* $277\frac{1}{5}$. *9.* 110 sq. in. *10.* $\$838\frac{4}{9}$.

Ex. CCLVII. *1.* (*a*) 85; (*b*) 650; (*c*) 1730; (*d*) 698.
2. (*a*) 528; (*b*) 1230; (*c*) 44; (*d*) 144.
3. (*a*) 456; (*b*) 782; (*c*) 390; (*d*) 225. *4.* 29 mi. *5.* 35 ft.
6. 274 ft. *7.* 20.78 in. *8.* 11.18 ft. *9.* 10 ft. *10.* $54.60.

Ex. CCLVIII. *1.* $91\frac{1}{8}$ cu. in.; $34\frac{21}{64}$ cu. in.; 14 cu. ft.; 197 cu. in.; 68 cu. ft.; 145 cu. in.
2. $121\frac{1}{2}$ sq. in.; $63\frac{3}{8}$ sq. in.; $35\frac{1}{24}$ sq. ft.; $100\frac{1}{24}$ sq. ft.
3. $31\frac{1}{2}$ cu. ft.; $99\frac{1}{2}$ sq. ft. *4.* $131\frac{1}{4}$ cu. ft.; $181\frac{1}{4}$ sq. ft.
5. 20 in.; $4\frac{17}{27}$ cu. ft. *6.* $\$41\frac{1}{4}$. *7.* $16\frac{4}{7}$ ft. *8.* $25\frac{1}{2}$ ft.; 17 ft.
9. 28.09 in. *10.* 1650 gal.

Ex. CCLIX. *1.* (*a*) $8\frac{5}{9}$ cu. ft.; (*b*) $115\frac{1}{2}$ cu. ft.; (*c*) 385 cu. ft.; (*d*) $133\frac{49}{72}$ cu. ft. *2.* (*a*) $29\frac{1}{3}$ sq. ft.; (*b*) 132 sq. ft.; (*c*) 220 sq. ft.; (*d*) $183\frac{1}{3}$ sq. ft.
3. $5\frac{25}{72}$ cu. yd. *4.* $66. *5.* (*a*) $31\frac{17}{36}$ sq. ft.; (*b*) $151\frac{1}{4}$ sq. ft.; (*c*) 297 sq. ft.; (*d*) 196 sq. ft. 101 sq. in.
6. $91\frac{2}{3}$ sq. ft.. *7.* $24.75. *8.* 1 ft. *9.* 1 yd. *10.* $14\frac{2}{3}$ cu. ft.

Ex. CCLX. *1.* 108 cu. ft. *2.* 2760 cu. in. *3.* 75 sq. ft.
4. 33 sq. ft. *5.* $33.75. *6.* 19250 cu. in.
7. (1) $86\frac{5}{8}$ sq. ft.; (2) 33 ft. *8.* 89.51 yd. *9.* $89\frac{5}{6}$ cu. ft.
10. 61 in.

Ex. CCLXI. *1.* (*a*) 154 sq. in. (*b*) $38\frac{1}{2}$ sq. in. (*c*) 616 sq. in. (*d*) 2464 sq. in.
2. $24.64. *3.* 14 ft. *4.* 132 ft.
5. (*a*) $905\frac{1}{7}$ cu. in. (*b*) $3620\frac{4}{7}$ cu. in. (*c*) $1437\frac{1}{3}$ cu. in. (*d*) $179\frac{2}{3}$ cu. in.
6. 4851 cu. ft. *7.* $14\frac{1}{7}$ cu. ft. *8.* 4 in. *9.* 110592. *10.* 2541.

Ex. CCLXII. *1.* 92.9 ft. *2.* 88 yd. *3.* 68 yd.; 867 sq. yd.
4. 391 ft. *5.* 75 ft. *6.* 43.3 sq. ft. *7.* 32 ft. *8.* 98 yd.
9. 820 in. *10.* 1120 yd.

Ex. CCLXIII. *1.* 43 ft. *2.* 242 yd. *3.* $\$22\frac{2}{9}$. *4.* 25.
5. $3\frac{3}{8}$ mi. *6.* 4.24 ft. *7.* 140 rd. *8.* 4 ft. *9.* $8063\frac{1}{8}$ lb.
10. $3.30.

Ex. CCLXIV. *1.* 14 ft. *2.* 3 in. tiles. *3.* 126 ft.
4. 704 sq. ft. *5.* 170 ft. *6.* 14175 sq. ft. *7.* 5544 sq. ft.
8. 79194 sq. ft. *9.* 140 sq. ft. *10.* $346\frac{1}{2}$ sq. in.

Ex. CCLXV. *1.* 80 ft. 90 ft. *2.* 5 A. *3.* 8232 sq. ft.
4. 28 sq. ft. *5.* 80 rd.; 120 rd.; 89.44 rd. *6.* 1560 sq. in.
7. 65 ft., 68 ft.; 60 ft. *8.* 72 ft. *9.* 2646 sq. in.; 4376 sq. in.
10. $112\frac{1}{2}$ ft.

Ex. CCLXVI. *1.* 63 ft. *2.* 308 sq. ft.; 385 sq. ft. *3.* 246.66 yd. *4.* 3630 men. *5.* 4800 ft. *6.* 40 rd. 20 rd. *7.* 2.18 ft. *8.* 12 ft. *9.* \$28.32. *10.* \$32.

Ex. CCLXVII. *1.* 52 ft. *2.* 10.39 yd. *3.* 23.54 ch. *4.* $3\frac{1}{3}$ ch. *5.* 56 yd. *6.* 42 ft. *7.* 414.12 ft. *8.* 21.213 ft. *9.* $292\frac{1}{2}$ sq. ft. *10.* $48\frac{1}{8}$ c. ft.

Ex. CCLXVIII. *1.* $38\frac{1}{2}$ sq. ft. *2.* 34.64 in. *3.* 27.71 in. *4.* $37\frac{1}{2}$ ft.; 30 ft. *5.* 1925 lb. *6.* 864. *7.* 192000 shot. *8.* 243 doz. *9.* 12 in. *10.* 48 oz.

Ex. CCLXIX. *2.* (1) 456 cm., (2) 45.60 dm., (3) 4.560 m. *3.* (1) 18.7 m., (2) 18700 mm., (3) 1870 cm. *4.* 1897009.434 m. *5.* 780.43 m.; 11.03 mm. *6.* 92.208 m.; 299.18892 m. *7.* 640 leaves. *8.* 27600 times. *9.* \$76.56. *10.* 7.6375 mi. *11.* \$555705. *12.* 28000 times.

Ex. CCLXX. *1.* 287.6345 hectares. *2.* 37856 ares. *3.* 57536 sq. cm.; 5753600 sq. mm. *4.* 2341700 sq. m. *5.* 542 sq. cm. *6.* 3030303 sq. m. *7.* 112 ares. *8.* 32.64 sq. m. *9.* \$2.50. *10.* 280500 bricks.

Ex. CCLXXI. *1.* 72.5 st. *2.* \$432.50. *3.* 25800 l. *4.* 23.375 c. m. *5.* 2.604 m. *6.* 1.40 c. m. *7.* 30 cm. *8.* 300 Hl. *9.* \$275.31. *10.* 8 ct.

Ex. CCLXXII. *1.* 5037 g.; 503.7 Dg. *2.* 3075 mg.; 30.75 dg. *3.* 8070006.5 cg. *4.* 2.756 Kg.; 275600 cg. *5.* 7.28 l. *6.* \$750. *7.* 264.6 Kg. *8.* \$420.15625. *9.* 310 mg. *10.* .00504.

Ex. CCLXXIII. *1.* (*a*) 70.25 m. (*b*) 808.7 l. (*c*) 15.908 a. (*d*) 27000.37 g.
2. 594 Kg. *3.* 47250 Kg. *4.* 2100 coins. *5.* 388 g. *6.* 110 st. *7.* 225 francs. *8.* 33 Hl. *9.* 650 g. *10.* 200 m. *11.* 50 ct. *12.* 190 mi. *13.* 477 times. *14.* 13.44 rolls.

Ex. CCLXXIV. *1.* $.\dot{3}$, $.\dot{4}\dot{5}$, $.\dot{9}\dot{6}$, $.\dot{7}6\dot{5}$.
2. $.\dot{4}$, $.\dot{1}4285\dot{7}$, $.\dot{2}8571\dot{4}$, $.\dot{4}2857\dot{1}$.
3. $.\dot{5}7142\dot{8}$, $.\dot{7}1428\dot{5}$, $.\dot{8}5714\dot{2}$, $.\dot{0}7692\dot{3}$.
4. $.\dot{2}3076\dot{9}$, $.\dot{3}8461\dot{5}$, $.\dot{6}9230\dot{7}$, $.\dot{6}\dot{3}$. *5.* $.8\dot{3}$, $.58\dot{3}$, $.93\dot{1}\dot{8}$, $.9\dot{2}8751\dot{4}$.
6. $.9\dot{4}2857\dot{1}$, $.9\dot{5}\dot{4}$, $.89\dot{2}8571\dot{4}$, $.15\dot{9}9\dot{0}$.
7. $.708\dot{3}$, $.4196\dot{4}2857\dot{1}$, $.5486\dot{1}$, $.1647\dot{7}\dot{2}$.
8. $.44\dot{2}3076\dot{9}$, $.721\dot{1}5384\dot{6}$, $.13920\dot{4}\dot{5}$, $.\dot{3}80952\dot{3}$.
9. $.20\dot{2}3809\dot{5}$, $.8\dot{2}7\dot{0}$, $.140\dot{7}6\dot{5}$, $.5050\dot{6}7\dot{5}$.
10. $.17013\dot{8}$, $.6867897\dot{7}\dot{2}$, $.35267\dot{8}5714\dot{2}$, $.201\dot{4}\dot{5}$.

Ex. CCLXXV. *1.* $\frac{5}{9}$, $\frac{17}{99}$, $\frac{4}{11}$, $\frac{8}{37}$. *2.* $\frac{2}{111}$, $\frac{1}{37}$, $\frac{1}{111}$, $\frac{16}{111}$.
3. $\frac{2}{37}$, $\frac{12}{37}$, $\frac{10}{27}$, $\frac{8}{27}$. *4.* $\frac{35}{37}$, $\frac{47}{111}$, $\frac{29}{37}$, $\frac{29}{111}$.
5. $\frac{99}{101}$, $\frac{12}{13}$, $\frac{1}{7}$, $\frac{2}{7}$. *6.* $\frac{21}{22}$, $\frac{19}{36}$, $\frac{21}{55}$, $\frac{10}{41}$.
7. $\frac{523}{666}$, $\frac{57}{550}$, $\frac{14}{825}$, $\frac{41}{3000}$. *8.* $\frac{29}{44}$, $\frac{1}{148}$, $\frac{329}{1350}$, $\frac{27}{70}$.
9. $\frac{35}{44}$, $\frac{43}{925}$, $2\frac{11}{37}$, $7\frac{25}{37}$. *10.* $4\frac{1}{150}$, $5\frac{1}{165}$, $7\frac{2}{333}$, $5\frac{5}{18}$.

Ex. CCLXXVI. *1.* $6.602\dot{4}\dot{4}$. *2.* $2.3\dot{0}60941229258\dot{8}$.
3. $9.48\dot{6}\dot{9}$; $14.0\dot{6}3672\dot{7}$. *4.* $.32\dot{4}5\dot{7}$; $.321\dot{4}\dot{7}$. *5.* $.73\dot{2}3177\dot{7}$.
6. $1.5\dot{9}\dot{0}$; $6.\dot{8}9\dot{3}$. *7.* $3\dot{3}\dot{9}$; $.4\dot{2}\dot{9}$. *8.* $.4675$; $.\dot{3}5064\dot{9}$.
9. $\dot{6}\dot{3}$; 10. *10.* $.54175$; $7.\dot{8}0\dot{5}$.

Ex. CCLXXVII. *1.* $10.\dot{5}$. *2.* $.\dot{4}\dot{2}$. *4.* $.1\dot{6}\dot{1}$; $.0\dot{3}$.
6. $33.\dot{1}4285\dot{7}.7$, £2 0s. $8\frac{2}{3}$. *8.* 3 t. 8 cwt. $35.\dot{3}$ lb.
9. 6 mi. 92 rd. 1.6 yd. *10.* 69 t. $888.\dot{8}$ lb.

Ex. CCLXXVIII. *6.* 7.456. *9.* $1\dot{3}$.

Ex. CCLXXIX. *1.* \$3780. *2.* 9215 cu. ft.
3. \$132, \$247.50, \$275. *4.* \$100. *5.* .0078125.
6. 33 mi. *7.* .405 hr. *8.* $16\frac{4}{31}$%. *9.* $.001\dot{2}\dot{9}$.

Ex. CCLXXX. *1.* $\frac{8}{15}$. *2.* $\frac{1}{9}$ da. *3.* $3\frac{1}{3}$ da. *4.* 14.7 da.
5. $\frac{7}{8}$. *6.* A 27 da., B. 54 da. *7.* A $19\frac{3}{5}$ da., B $9\frac{4}{5}$ da., C $39\frac{1}{5}$ da.
8. $4\frac{1}{2}$ da. *9.* 18 da. *10.* $4\frac{1}{6}$ hr.
11. A $36\frac{2}{3}$ da.; B $73\frac{1}{3}$ da.; C 110 da. *12.* 15 da. *13.* 32 hr.
14. $1\frac{1}{2}$ hr. *15.* 8 horses. *16.* A $3\frac{1}{15}$ da.; B $3\frac{17}{30}$ da.; C $5\frac{1}{15}$ da.
17. A \$1.10; B \$1.

Ex. CCLXXXI. *1.* 12 min.; 24.min.; 30 min. *2.* 18 min.
3. $16\frac{4}{11}$ min. past 3. *4.* $16\frac{4}{11}$ min. past 6.
5. $32\frac{8}{11}$ min. past 6. *6.* 24 min. past 6.
7. 24 min. past 6 and $41\frac{5}{11}$ min. past 6.
8. (*a*)$43\frac{7}{11}$ min. past 8, (*b*)$27\frac{3}{11}$ min. past 8, (*c*) $10\frac{10}{11}$ min. past 8.
9. $49\frac{1}{11}$ min. past 9; $54\frac{6}{11}$ min. past 10; 12 o'clock.
10. $23\frac{1}{13}$ min. past 5.

Ex. CCLXXXII. *1.* $13\frac{1}{11}$ min. past 4. *2.* $19\frac{7}{11}$ min. past 3.
3. $31\frac{7}{23}$ min. past 3. *4.* 120 da.; 44 min. past 11; 14 min. past 12.
5. 75 da. *6.* 36 min. past 6 a.m., Friday. *7.* $5\frac{5}{59}$ min. past 5.
8. $5\frac{1}{2}$ min. past 9 p.m. on Tuesday, and $57\frac{1}{4}$ min. past 8 p.m.
9. 3 p.m., May 3. *10.* $43\frac{3667}{4331}$ min. past 9 p.m.

Ex. CCLXXXIII. *1.* 44 ft. *2.* $34\frac{1}{11}$ mi. *3.* $22\frac{1}{2}$. *4.* $7\frac{1}{2}$ sec.
5. 14 min. 24 sec. *6.* 8 hr. *7.* $33\frac{3}{4}$ mi. *8.* $7\frac{1}{3}$ yd. *9.* $32\frac{69}{80}$.
10. Gains $10\frac{10}{143}$ min.

Ex. CCLXXXIV. *1.* 224, 141. *2.* 4 mi. *3.* $\frac{2}{3}$ mi. *4.* $\frac{1}{2}$ hr.
5. $4\frac{7}{8}$ mi. *6.* 2 mi. *7.* 45 min. *8.* 3 mi. *9.* 5 to 1. *10.* $2\frac{1}{4}$ hr.

Ex. CCLXXXV. *1.* $1\frac{2}{5}$ mi. *2.* 45 mi., 36 mi. *3.* 114 yd. *4.* 45 mi. *5.* 11 min. *6.* 396 ft. *7.* $94\frac{4}{9}$ yd. *8.* 22 mi. *9.* $23\frac{1}{3}$ mi. *10.* $6\frac{2}{3}$ mi. *11.* $6\frac{2}{3}$ hr.

Ex. CCLXXXVI. *1.* \$1.92. *2.* 325, 175, 125. *3.* \$620. *4.* 74; 3s. $8\frac{1}{2}$d. *5.* 17. *6.* 23. *7.* £16 6s. *8.* 1980. *9.* 2 hr. 24 min. *10.* 200 lb.

Ex. CCLXXXVII. *1.* 144 min. *2.* Men, \$12.50; women, \$8; boys, \$5.25. *3.* 7 bbl. *4.* 1022. *5.* 75 yd. *6.* 32 da. *7.* 17 mi. *8.* \$80. *9.* 110 sheep, 140 pigs. *10.* \$51.

Ex. CCLXXXVIII. *1.* \$12800. *2.* 123 gal. *3.* \$672. *4.* 720 apples. *5.* \$75. *6.* £140. *7.* \$97.50. *8.* 223 sec. *9.* John, \$880; Thomas, \$176; Henry, \$22. *10.* 56 ct.

Ex. CCLXXXIX. *1.* \$27. *2.* 26 ft. 6 in. *3.* 4 ft. 1 in. *4.* 15 ct. *5.* 2688 rails. *6.* 20, 21, 22, 23. *7.* 182. *8.* \$60. *9.* 7875 shingles. *10.* 150 lb.

Ex. CCXC. *1.* \$90, \$60. *2.* 3 mi. *3.* 87 da. *4.* Latter, 51 ct. *5.* $\$20.024\dot{6}$. *6.* \$8460. *7.* \$870, 6%. *8.* \$2.50. *9.* 19 da.

Ex. CCXCI. *1.* \$900, \$1350, \$1800. *2.* \$36. *3.* Gain, 72 ct. *4.* 230400 A. *5.* 49.90 rd, 37.43 rd. *6.* \$2.50. *7.* 100 ft. by 76 ft. *8.* \$321.25. *9.* \$354. *10.* \$7.50.

Ex. CCXCII. *1.* A, 30 ct.; B, 36 ct.; C, 40 ct. *2.* 160 leaps. *3.* \$2450. *4.* $130\frac{1}{2}$ sec. *5.* \$500. *6.* 80c. *7.* $1\frac{1}{4}$ yd. *8.* 900 lb. at 7 ct.; 1100 at 10 ct. *9.* 248 yd., 62 yd. *10.* \$440.

Ex. CCXCIII. *1.* 396 ft. *2.* \$329. *3.* Divisor, 547; Quot., 3233. *4.* $\$4\frac{1}{6}$. *5.* \$23.50. *6.* A's rate is to B's as 79 to 60. 7. 409036320 post-holes. *8.* A, \$432; B, 216; C, \$1296. *9.* \$1680. *10.* \$300; \$450.

Ex. CCXCIV. *1.* 294; 84. *2.* \$900, \$750. *3.* \$200. *4.* $\frac{33}{101}$. *5.* \$400. *6.* \$240, 5 yr. *7.* $2\frac{1}{2}$ in. *8.* 300 leaps. *9.* 9 hr. *10.* 24 mi.

Ex. CCXCV. *1.* \$4.80. *2.* 8%, 9%. *3.* $31\frac{9}{10}$%. *4.* $3060\frac{5}{12}$ bu. *5.* 224. *6.* 60 mi. per hr. *7.* $16\frac{1}{3}$ da. *8.* $813\frac{1}{3}$ cu. yd. *9.* $4\frac{7}{10}$ da. *10.* A, \$776.16; B, \$693; C, \$630; D, \$600.

Ex. CCXCVI. *1.* 405 bu. *2.* 24 ft. by 18 ft. by 12 ft. *3.* 4.5 cu. ft. *4.* Gain, \$14. *5.* 8000 oranges. *6.* $5\frac{1}{8}$s.; 56 oz. gold; 160 oz. silver. *7.* \$2480. *8* $1\frac{1}{3}$ mi. per hr. *9.* 20 min. past 4 a.m. *10.* \$217.80.

Ex. CCXCVII. *1.* 1152 sq. ft. *2.* 4%. *3.* $\frac{81}{256}$. *4.* 14.625 in. *5.* $\frac{25}{37}$; $\dot{6}7\dot{5}$. *6.* 14.288 to 1. *7.* $48\frac{3}{4}$ ct. *8.* $\$3\frac{1}{8}$. *9.* \$1.80. *10.* 190.

Ex. CCXCVIII. *1.* 272 rd. *2.* $77\frac{1}{8}$. *3.* 24 ct.; loss, 4%. *4.* Length, 34 ft.; width, 26 ft.; height, 12 ft. *5.* $4\frac{3}{8}$ mi. *6.* $3675\frac{3}{8}$ t. *7.* \$441. *8.* 63 yr.; 35 yr. *9.* 567 leaves. *10.* 104 da.

Ex. CCXCIX. *1.* 213 plants. *2.* \$4500. *3.* $2\frac{1}{4}$ mi. *4.* 100 lb. *5.* 28 ct. *6.* \$2625. *7.* \$4000.
8. .384 in. (Note, their length and width being equal.)
9. 164.7114 in. *10.* A, \$1035; B, \$1656; C, \$2025.

Ex. CCC. *1.* 2 to 5. *2.* $13\frac{7}{11}$ min. past 4, or 30 min. past 4. *3.* \$40. *4.* 5 yd. *5.* \$1.02; 80 ct. *6.* \$3250; \$2600. *7.* $233\frac{11}{12}$ ft. *8.* 3 to 2. *9.* $2\frac{1}{4}$ ft. *10.* \$1600; 15 mo.

Ex. CCCI. *1.* $\frac{1}{45}$. *2.* A, \$2.90$\frac{5}{8}$; B, \$5.09$\frac{3}{8}$. *3.* 10 mo. *4.* 10 in. *5.* \$3. *6.* 90. *7.* 3 hr. *8.* 525 lb., 495 lb., 390 lb. *9.* \$2100, \$1750, \$1050, \$700. *10.* B, by 50 yd. in $4\frac{3}{4}$ min.

Ex. CCCII. *1.* 141.4 sq. ft. *2.* A, \$600; B, \$780; C, \$180; D, \$2000. *3.* \$2000; \$1296. *4.* 4%; $4\frac{1}{2}$%. *5.* 60 ct. *6.* 32 men. *7.* $15\frac{1}{3}$ mi. *8.* \$62500. *9.* $11\frac{2}{3}$ min. past 12. *10.* \$9$\frac{8}{13}$; \$9$\frac{4}{5}$.

THE END.

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